SOUTHERN RHODESIA.

Report

on

The Public Health

For the Year 1934.

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Report on the Public Health for the Year 1934.

INTRODUCTION.

In the year 1934 Southern Rhodesia had a high birth rate, a low death rate and a very low infant mortality rate. The maternal mortality rate was less satisfactory.

Improved hospital methods, increasing confidence in institutional treatment, and better facilities for rapid transport are tending in Southern Rhodesia, as elsewhere, to cause a rapidly growing demand for hospital accommodation. To meet this the Government have commenced a carefully considered programme of building, which, when completed, will enable the hospitals of Southern Rhodesia to afford facilities comparable with those of the best institutions of a similar size in any country in the world. This programme includes a large general hospital at Bulawayo, with a training school for midwives attached; a new hospital at Gwelo, and at Salisbury a new treatment block containing two operating theatres, an up-to-date X-ray photographic and treatment installation, a new physio-therapeutic department and a new out-patients' department, etc.

The world-wide extension of hospitals, due to the above causes, has resulted in improved methods of construction. The Government have decided to adopt in their new hospitals the modern arrangement of placing beds parallel to instead of at right angles to the walls and windows. This arrangement revolutionises hospital wards from the point of view of the comfort of the patients, as it practically converts the old "barrack-room" type of ward into a series of small four-bedded wards. Another recent introduction which will be included in the new Government hospitals is the insertion of side wards for post-anæsthetic and other cases which may be disturbing in a general ward. Hospital architects have also given much attention to the reduction of both internal and external noise, and this point will be carefully considered in the new buildings.

The treatment of natives in reserves, which have hitherto been almost devoid of medical facilities, has been extended during the year by additions to the Ndanga and Mtoko Native Medical Units (central hospitals with outlying dispensaries). It is hoped that this most efficient and economical method of treating natives will be extended further during the coming year.

Additions have been made to the Mental Hospital at Bulawayo, and the working of this institution is being re-organised by the Medical Superintendent on modern lines.

CHAPTER I.—VITAL STATISTICS.

(1) Population.

The estimated European population for 1934 was 52,950; Coloured, 2,550; Asiatics, 2,000; while the native population, in regard to which we have not accurate figures, is considered to be 1,154,500. The total estimated population is thus 1,212,000. The European rate of natural increase per 1,000 population (excess of births over deaths) is satisfactorily high, being 13 as compared with the much lower figure of 2 for England and Wales. The gross number of immigrants was 1,936 and the estimated net immigration 645.

(2) BIRTHS.

There were 1,206 European births in 1934, corresponding to an annual birth rate of 22.78 per 1,000 of the population. Of these 22 or 1.8 per cent. were illegitimate—a very low proportion of illegitimate births. The birth rate of Southern Rhodesia, which had been falling sharply since 1930, rose in 1934 from 21.52, the figure for the previous year. This rise is probably an indication of increasing prosperity. It is a high birth rate, and is partly due to the fact that the Colony contains a larger proportion of persons of child-bearing age than older countries. The birth rates of recent years are given below and compared with those of the Union of South Africa and of England and Wales.

European Birth Rates, 1921-1934.

	Southern Rhodesia.	Union of South Africa.	England and Wales.
1921-30 (average)	24.6	26.6	18.3
1930	24.2	26.4	16.3
1931	23.6	25.4	15.8
1932	22.8	24.2	15.3
1933	21.5	23.7	14.4
1934	22.8	Not available	14.8

(3) DEATHS.

A. *Number of Deaths.*—There were 508 European deaths in 1934, corresponding to an annual death rate of 9.59 per 1,000 of the population. For reasons which are given later, this is a higher death rate than that of the previous year, which was almost the lowest on record in the Colony. The following table gives the death rates of recent years compared with those of the Union of South Africa and of England and Wales, the standardised rates giving the alterations necessary to allow for differences of age and sex distribution in the countries concerned. It will be noted that the rates for Southern Rhodesia compare satisfactorily with those of the Union and also of England and Wales.

European Death Rates, 1921-1934.

	Crude death rate, Southern Rhodesia.	Standardised death rate.		
		Southern Rhodesia.	Union of South Africa.	England and Wales.
1921-30 (average)	9.5	11.2	10.4	10.6
1930	9.2	10.0	10.1	10.8
1931	8.3	8.8	9.6	10.2
1932	9.5	11.3	10.0	9.7
1933	8.5	9.2	9.3	9.8
1934	9.6	10.9	Not available	Not available

B. Causes of European Deaths.—The following table shows the causes of European deaths in Southern Rhodesia during the last five years. Further details are given in Table 1 at the end of this report.

Causes of European Deaths, 1930-1934.

Name of disease.	1934.	1933.	1932.	1931.	1930.	Totals.	Percentage of total deaths,
1. Heart diseases	63	36	43	49	39	230	10.03
2. Malaria and blackwater fever ...	52	47	37	36	28	200	8.72
3. Violence (all forms)	46	38	43	53	44	224	9.76
4. Cancer	41	37	49	23	52	202	8.81
5. Pneumonia and bronchitis ...	36	31	42	42	50	201	8.76
6. Nervous diseases	33	29	37	27	23	149	6.50
7. Premature birth and diseases of early infancy	25	31	24	24	23	127	5.53
8. Influenza	20	8	17	10	11	66	2.88
9. Dysentery	14	13	4	6	8	45	1.96
10. Tuberculosis (all forms)... ...	11	14	17	15	19	76	3.31
11. Enteric fever	10	4	6	2	6	28	1.22
12. Diarrhœa and enteritis	9	11	14	14	16	64	2.79
13. Diphtheria	5	8	6	2	3	24	1.05
14. Old age	4	11	10	5	10	40	1.74
15. Whooping cough	1	6	4	1	2	14	.61
16. Measles	...	...	...	...	...	...	...
17. Scarlet fever	...	...	...	...	...	...	...
18. Other causes	138	117	132	108	109	604	26.33
Totals	508	441	485	417	443	2,294	100.00

1. *Heart Diseases.*—The position occupied by heart disease, which is at the head of the list, is the same as in England and Wales. There is an increase over the previous year. In this connection it must be borne in mind that there are more old people in the Colony as years go by, and therefore the proportion of deaths from heart disease approximates nearer to that of older countries. Acute rheumatic infection, a common cause of heart disease in Europe, is rare in Southern Rhodesia.

2. *Malaria and Blackwater Fever.*—Climatic conditions favoured the growth of anopheline mosquitoes in 1934, resulting in a slight increase in the number of deaths. This disease is further discussed under the section dealing with malaria in Chapter II.

3. *Violence.*—Nine deaths from motor accidents are regretted, though not a high proportion compared with older countries. The question of safe conditions for fast traffic is one which should enlist the interest of local authorities in preparing their schemes under the Town Planning Act.

4. *Cancer.*—Cancer occupies the third place amongst diseases and shows an increase over last year. It is probably not more prevalent than a generation ago. The apparent increase is due partly to the greater proportion of older people in the population and partly to improved methods of diagnosis.

5. *Pneumonia and Bronchitis.*—We know of no means of reducing the incidence of these world-wide diseases, which affect both English and Colonial populations to a very similar extent.

6. *Nervous Diseases.*—The majority of deaths from nervous diseases were due to cerebral hæmorrhage. The proportion of deaths under this heading is also very similar to that in England.

7. *Tuberculosis.*—Tubercular patients do well in Southern Rhodesia. In 1934 this disease was tenth on the list, while in England it is usually fifth.

(4) INFANT MORTALITY.

There were 54 deaths of European infants under one year of age, corresponding to the very low infant mortality rate of 45 per 1,000 births. In addition, 21 still-births, also a very low figure, were registered. It is accepted that the infant mortality rate is a reliable index of social conditions, and it is most satisfactory to compare the rate of Southern Rhodesia with the much higher rates of England and Wales and of the Union, as indicated in the table below.

European Infant Mortality Rates, 1921-34.

	Southern Rhodesia.	Union of South Africa.	England and Wales.
1921-30 (average)	63	70	72
1930	45	67	60
1931	45	63	66
1932	55	69	65
1933	55	60	64
1934	45	Not available	59

It is nevertheless necessary to point out that we are still losing a number of valuable infant lives each year from causes which are definitely preventable, as will be seen from a glance at the following table.

Causes of Infant Deaths for Ten Years, 1925-1934.

Disease.	No. of deaths.	Percentage.
Premature births and diseases of early infancy	243	40.50
Bronchitis and pneumonia	71	11.83
Diarrhœa and enteritis	73	12.16
Malaria	55	9.17
Measles, whooping cough, diphtheria, dysentery	40	6.67
Various, not classified above	118	19.67
Totals	600	100.00

Infant Deaths during Different Months, 1925-1934.

	No. of deaths.	Percentage.
First month	287	47.83
Two months to six months	187	31.17
Six months to twelve months	126	21.00
Totals	600	100.00

Neonatal deaths, i.e., deaths of babies within the first month of life, are responsible for nearly half of this rate. Improved attention before and at the time of birth can reduce this mortality rate. It will be noted that other important causes of infant mortality are bronchitis and pneumonia, diarrhœa and enteritis, malaria, etc. Such diseases can be, to a great extent, prevented by a wider knowledge of the hygiene of infant life.

The Municipality of Salisbury have fallen into line with modern local authorities in other countries in employing a health visitor, a course which is recommended for consideration of other authorities throughout the Colony. Government grants are available for this purpose.

Child Welfare Societies perform excellent work in some of our large towns. In Bulawayo this Society maintains a well equipped and well staffed infant welfare centre and crèche. There is also an active organisation in Salisbury. An extension of these societies is strongly recommended with a view to further reducing our infant mortality rate.

(5) MATERNAL MORTALITY.

During the year 1934 there were 9 deaths of European mothers directly due to childbirth, corresponding to a maternal mortality rate of 7.46 per 1,000 live births. This shows an increase as compared with last year, and contrasts with the low general death rate and very low infant mortality rate. England is doing her utmost to reduce her maternal mortality rate, although it is lower than in this Colony, being about 4.5 as compared with our 7.46. The maternal mortality rates of Southern Rhodesia during recent years are given below and compared with those of the Union of South Africa and of England and Wales.

European Maternal Mortality Rate, 1921-1934.

	Southern Rhodesia.	Union of South Africa.	England and Wales.
1921-30 (average)	5.4	5.1	4.1
1930	6.0	5.3	4.4
1931	5.1	4.7	4.1
1932	6.0	5.3	4.2
1933	6.3	4.78	4.5
1934	7.46	Not available	Not available

The causes of maternal deaths during the last ten years were as follows:

European Maternal Deaths, 1925-1934.

Cause of death.	No. of deaths.	Percentage of Total.
Puerperal sepsis	18	28.13
Accidents of pregnancy	12	18.75
Other accidents of childbirth	8	12.50
Puerperal hæmorrhage	9	14.06
Puerperal albuminuria and toxæmia	9	14.06
Other causes	8	12.50
Totals	64	100.00

An enquiry into the causation of maternal deaths, on the same lines as that of the British Government, has been held again this year. Information received suggests that attention to the following points will bring about a reduction in maternal mortality:—

(a) *Ante-Natal Care.*—The lack of skilled supervision during pregnancy is still very noticeable. Every year this is quoted as being a contributing cause toward maternal mortality, and too much emphasis cannot be laid on the desirability of an increase in the number of organisations interested in maternity and child welfare.

In order to provide information for expectant mothers, a series of nine letters has been printed, which will be forwarded each month to mothers who care to ask for them. These letters can be received from the Public Health Department, Salisbury, and also through various child welfare societies and maternity homes.

(b) *Services of Trained Midwives.*—In some instances interference by unskilled midwives before qualified assistance has been sought is considered to have resulted in the death of the patient. It is the intention of the Government to push forward as rapidly as possible the institution of a training school for midwives in connection with the Bulawayo Hospital.

(c) *Maternity Homes.*—Excellent maternity homes, provided with the assistance of the Beit Trustees and the Government, are in working at ten centres in the Colony. These homes are exceedingly popular, but are not utilised to the extent they should be.

CHAPTER II.—INFECTIOUS AND COMMUNICABLE DISEASES.

(1) NOTIFICATION.

Although the notification of the more important infectious diseases is compulsory under the Public Health Act, it is very incomplete. The following figures, which are taken from various returns, give some idea of the infectious diseases prevalent among the European population. The figures for the native population necessarily deal with only a small proportion thereof.

Infectious Diseases, 1934.

Name of Disease.	European Cases.	Native Cases.
Scarlet fever	22	—
Whooping cough	191	109
Chickenpox	286	140
Enteric fever	49	62
Diphtheria	36	30
Measles	382	30
Scarlatina	3	—
Cerebro-spinal fever	3	28
Mumps	14	4
Erysipelas	5	1
Trypanosomiasis	—	7
Smallpox	—	41
Puerperal septicæmia	3	4
Poliomyelitis	2	3

(2) MALARIA.

In 1934 there were registered 38 deaths from malaria and 14 from blackwater fever—total 52. The slight increase from the previous year appears to be due to the fact that mosquito breeding was possible till a later date than usual owing to a winter of record warmth, accompanied by late rains.

With a view to tackling the problem of malaria at its source, the Government secured the services of Mr. H. S. Leeson, Medical Entomologist of the London School of Hygiene and Tropical Medicine, for the whole of the last wet season. Those portions of Mr. Leeson's report which are of most interest to the public are given as an appendix to this report. The report will be published in complete form in England.

Mr. Leeson confirmed his previous researches in Southern Rhodesia to the effect that only two out of the sixteen known varieties of anopheline mosquitoes need for practical purposes be considered as vectors of malaria. Mr. Leeson worked out the habitats of these varieties and showed that their breeding places are strictly limited. This enables anti-larval measures, which have hitherto failed in the frequently hopeless task of attacking *all* mosquito breeding places, to be reduced to the practical proposition of attacking only certain defined types of breeding places.

In order to give effect to these findings, a pamphlet dealing with malaria, couched in simple language, has been issued by the Government and distributed free of charge throughout the Colony.

(3) DIPHTHERIA.

During 1934 there were notified 36 European cases of diphtheria and 5 deaths, as compared with 65 cases and 8 deaths during the previous year. It is satisfactory to note this reduction, but it is necessary to emphasise the statements made in my previous reports, that no European child in Southern Rhodesia need suffer from diphtheria, and certainly no child should die from the disease.

In the year 1932 the Government brought before the public the knowledge and the means necessary for preventing diphtheria, and pointed out that a method of inoculation which is simple, safe and effective had been evolved for protecting children against this disease. The necessary material for inoculation is provided by the Government at cost price (7s. 9d. post free), and parents are strongly urged to have their children protected by the time they reach their first birthday. Immunisation can, in addition, be employed at any age with satisfactory results.

Diphtheria is present in practically every civilised country in the world, and the virulence of the disease is possibly increasing rather than diminishing.

(4) DYSENTERY.

Bacillary Dysentery.—This disease continues to be endemic amongst Europeans and natives, but the causal organisms have shown a significant variation in the last two years. Formerly, the pathogens concerned were, in the main, either members of the paradysentery group or *B. dysenteriæ* Flexner. Only rarely was *B. dysenteriæ* Shiga isolated.

The report of the Public Health Laboratory, Salisbury, however, shows that during the recent dysentery season, 57 per cent. of the organisms isolated were identified serologically as *B. dysenteriæ* Shiga. These figures, of course, pertain only to Salisbury and its immediate environs, but suggest that at some recent date a Shiga "carrier" has been introduced into the community concerned.

Chronic bacillary dysentery is met with most frequently amongst natives, but occasionally amongst Europeans.

Amœbic Dysentery.—This form of dysentery occurs with much greater frequency than was hitherto supposed. During the year 34 cases of active amœbic dysentery were reported from the Public Health Laboratory, Salisbury, European cases numbering 14 and native cases 20. It appears that the apparent increase in the incidence of amœbic dysentery is due to the fact that practitioners are availing themselves to a great extent of the improved laboratory facilities placed at their disposal by the Government. At any rate, these figures clearly indicate the need for the careful laboratory investigation of all cases of dysentery before instituting treatment.

Helminthic Dysentery.—Cases of recurrent dysentery or severe diarrhœa due to infections with *S. mansoni* are met with from time to time, chiefly amongst natives, but also amongst Europeans.

(5) LEPROSY.

The Government maintain two leprosy hospitals of practically equal size—one at N'gomahuru and one at Mtoko. In addition, Mnene Medical Mission, which is subsidised by the Government, has a leprosy section attached to its hospital. The leprosy hospitals are really large estates in which the patients' mode of life approximates as nearly as possible to their natural conditions. The Leprosy Laws are in force, but these hospitals as far as is possible resemble voluntary institutions. The success of the Government's policy is indicated by the fact that the number of lepers under treatment has risen in six years from 508 in 1929 to 1,312 last year, the actual increase in 1934 being over 200 patients. Further, a large proportion of patients now ask for admission. This means not that there are more cases in the Colony, but that more are seeking treatment.

In 1934, principally by means of funds provided by the generosity of the British Empire Leprosy Relief Association, an excellent treatment block was erected on modern lines at Mtoko, and a European orderly has been provided. During the coming year it is proposed to rehouse completely the patients, who at present live in pole and dagga huts, and different types will be suitably classified. Bonney's Blue has been extensively utilised at Mtoko in the treatment of patients with favourable results, and will be given further trial during the coming year.

At Ngomahuru 80 new huts were erected during the year. Iodised esters constitute the drug chiefly used, and the Medical Superintendent reports that the results of this treatment are very satisfactory.

Leprosy institutions are now looked upon as curative hospitals and not as prisons. A large number of "arrested" cases are discharged each year—78 from N'gomahuru and 57 from Mtoko in 1934. The return of these patients to their kraals has an excellent effect, and the number of patients who come voluntarily for treatment increases every year.

The extensive health surveys of the Lomagundi and Sebungwe districts made by the sleeping sickness expeditions indicates that the number of lepers in these two large districts is very small. While we have no accurate knowledge of the number of cases in the Colony, there is every reason to think that it is not very large and that the proportion of cases under treatment is relatively high.

The Government are greatly indebted to the British Empire Leprosy Relief Association for the generous grants they have made from time to time, especially towards the erection of the leprosy hospital at Mtoko, and also for assistance in obtaining leprotic drugs, some of which are very expensive.

The following table shows the working of the above-mentioned institutions during the year:—

Lepers Treated in 1934.

Institution	On register, 1.1.34.	Admitted, 1934.	Discharged or died.	On register, 31.12.34.	Total cases treated, 1934.
N'gomahuru	479	157	104	532	636
Mtemwa (Mtoko)	460	159	83	536	619
Mnene Mission	41	16	15	42	57
	980	332	202	1,110	1,312

(6) HELMINTHIASIS.

Evidence is now accumulating that bilharzial infection of the intestinal tract occurs not infrequently amongst Europeans, particularly those whose work takes them into native reserves. A helminthological survey carried out in 1930 showed that amongst town-dwelling Europeans the incidence of intestinal bilharziasis was only 1.5 per cent., while this year the incidence of this disease amongst the same type of community amounted to 1.2 per cent. On the other hand, a parasitological survey of a small group of individuals who spend a considerable proportion of their time in native reserves revealed an incidence of 17 per cent.

Another bilharzial survey was conducted by Mr. Alves, Senior Assistant, Public Health Laboratory, in the Umvuma-Enkeldoorn district, where urinary bilharziasis was believed to be rife. Amongst European children the incidence of the disease was found to be as follows: boys, 36 per cent.; girls, 10 per cent. These results were obtained from a group of children, several of whom had already received a course of Fouadin. Amongst the natives in the same district the incidence of the disease was 50 per cent.; whereas amongst the mixed native community of the Salisbury Native Hospital, an incidence of 23 per cent. was found.

All the evidence shows that bilharzia disease is more readily acquired in some areas than in others, hence evidence from one area does not necessarily constitute an index of the incidence of bilharzia disease generally. For this purpose, several separate surveys would be necessary.

The problem of control is one of singular difficulty, largely on account of the irregular distribution of snail-containing collections of water throughout the country. Almost every farm has its bathing pool in which "bilharzia snails" can be found with great regularity, and, as bathing is indulged in freely in a variety of pools and rivers, it is impossible to render all snail free. Probably the best method of tackling the problem at the present time consists in the free dissemination of information concerning the bionomics of the intermediate hosts, the mode of infection and the early clinical features of the disease, and for this purpose a pamphlet is being prepared for public distribution.

The only other helminthic infection of importance is that due to the hookworm. No European cases were reported during the year. Amongst a mixed community of natives, the incidence was found to be 16 per cent., but in most cases only light infections were recorded. In some of the moister parts of the country, however, hookworm infections are not only more numerous, but the individual carries a heavier "hookworm load" than is encountered in the average native of the towns. As compared with bilharzia disease, hookworm disease (as opposed to hookworm infection) is of secondary importance.

In regard to other helminthic infections, a summarised account is given later in the report of the Public Health Laboratory, Salisbury.

(7) Human Trypanosomiasis.

During 1933-34 there was a small outbreak of this disease, which had been present to a slight extent in a limited area of the Colony since 1912. The district where the outbreak occurred was in the neighbourhood of the Umniati and Umfuli Rivers in the western portion of the Hartley district. Ten native cases occurred, while two Europeans, who had gone into a region known to be undesirable, developed the disease.

In view of this the Government decided to make an extensive survey of the area of the Colony infested with *Glossina morsitans*, consisting of a belt stretching from the eastern portion of Wankie district along the northern border of the Colony to the western portion of Darwin district. This area covers about 20,000 acres of the lower and hotter portion of the Colony, and is, with the exception of the Darwin portion, sparsely inhabited. Under Dr. Blair and Dr. Jeffares respectively, two fully equipped medical expeditions spent from four to five months upon this work, covering a large extent of ground and examining 12,839 natives; blood slides to the number of 1,127 were taken. The Umniati-Umfuli district was investigated with great care and detail, and it is certain that practically all natives in the area were examined. Surveys of the Lomagundi and Darwin areas were made from three points. The northern half of the Sebungwe was also investigated. It was not found possible to complete the southern portion of this area, which will be dealt with in the coming dry season. The results are extremely interesting, and may be summarised as follows:—

(1) No trace of sleeping sickness was found in Lomagundi and Darwin districts. No case has ever been known to occur in this region, which is frequently traversed by Europeans. It may be regarded as free from sleeping sickness. (2) No cases of sleeping sickness were found in the northern portion of the Sebungwe district, and no case has ever been known to occur there, although European officials frequently travel in this area. It is most unlikely that there is any sleeping sickness there. (3) An extensive investigation of the Umniati-Umfuli district revealed three cases of sleeping sickness, all in or near the village of Gowe. Two of these were chronic carriers of the trypanosome, otherwise in good health. The third was an acute case. The infection of most of the cases which occurred in 1933-34 can be traced directly or indirectly to this village.

It can be concluded from these surveys that the position in Southern Rhodesia in respect of sleeping sickness is most satisfactory. By far the greater portion of the *Glossina morsitans* area is entirely free from the disease. One very small focus was found, probably due to a single carrier. Steps are being taken to stamp out this focus.

(8) Tick Typhus Fever.

It is suggested that the term tick-typhus should be employed instead of the terms pseudo-typhus, Rhodesian ten-day fever, etc., since the evidence now available indicates (1) that this disease falls into the category of the typhus fevers, and (2) that it is transmitted by means of a tick although the tick concerned has not yet been identified. Although the disease has now been reported from many parts of the country, it appears to have a focal distribution, and so far has not been met with amongst the native races. It occurs most frequently in the early months of the year, and while the mortality rate appears to be nil, it is capable of producing a severe and debilitating illness, which necessitates a prolonged convalescence.

The incubation period is probably from seven to ten days, and the febrile period lasts on an average from ten to twelve days, after which the temperature falls by rapid lysis leaving the patient in a weak and debilitated condition. The course of the disease does not appear to be affected by any form of treatment at present available.

(9) Smallpox.

Smallpox is endemic in neighbouring territories from which there is extensive immigration of native labour each year. The Government adopt two main preventive measures: (1) vaccination of all immigrant natives at the frontier; (2) vaccination of all natives in a considerable area surrounding any outbreak. Although such outbreaks not infrequently occur, these measures have proved effective in preventing the disease from gaining a footing in the Colony, and no epidemic has taken place for several years. During the year 41 native cases were reported. No case has occurred among our well vaccinated European population of recent years. The expenditure on lymph in 1934 amounted to £1,060.

(10) Plague.

Plague occurs in neighbouring territories, but seems never to have been reported in Southern Rhodesia. A watch is kept in our frontiers for any unusual mortality amongst our veld rodents. If these once became infected it might prove impossible to eradicate a disease which is most destructive of human life.

(11) Venereal Disease.

Venereal disease is probably less common among our European population than in older countries. Among the natives it is as prevalent as in other tropical regions. Treatment is expensive, and no Government can deal with more than a limited number of native cases. No effective reduction can be anticipated until it is possible to include a considerable portion of the native population in the network of native medical units such as the Government have instituted in the Ndanga and Mtoko areas.

The Government maintain a number of treatment centres and subsidise municipalities and medical missions for this purpose. Anti-venereal specifics are granted free to approved institutions. On these measures the Government spend about £6,000 a year.

(12) Typhus Fever, Rabies.

These dangerous diseases occur in adjoining territories, but no cases have been reported in Southern Rhodesia for some years.

(13) Tuberculosis.

There were 11 deaths from all forms of tuberculosis in 1934, as against 14 in the previous year. Deaths from this disease show some diminution, possibly as the result of careful supervision of immigration. The disease is distinctly less common in this Colony than in older countries, and patients who have come from there do well in this climate. Nevertheless, there are sufficient cases to require separate accommodation, and it is hoped that this will be placed early in the Government's building programme. Both from their own point of view and from that of the other patients it is undesirable to keep consumptive cases in general hospital wards.

(14) Enteric Fever.

There were notified 49 European cases and 10 deaths during the year, which is above the average for this disease in the Colony. Typhoid fever is not uncommon among natives, and native carriers were possibly responsible for a small outbreak which occurred during the year in one of our larger towns. Protection of food supplies, better accommodation for native employees, and extension of water-borne sewerage, are important measures in combating the disease.

(15) Whooping Cough, Measles, Scarlet Fever, Chickenpox, German Measles.

As is the case in other countries, these highly infectious diseases occur from time to time amongst European children, especially in centres where there are large schools. They can be controlled only to a limited extent. One European death from whooping cough occurred during the year. Both this disease and also chickenpox are common amongst the native population.

(16) Influenza.

There was a considerable epidemic of influenza during the year, which was responsible for 20 European deaths.

(17) Yaws.

Numerous cases of yaws occur in the lower and warmer regions of the Colony, Ndanga area being perhaps the most affected. Active measures are being taken in regard to this disease by Dr. Kennedy, who is in charge of the Native Medical Unit in that district. A focus is known to exist in the northern portion of the Sebungwe district covering an area of considerably size. The Government are taking steps to deal with this area.

(18) Cerebro-Spinal Meningitis.

Three European deaths from this disease occurred in 1934. As in other countries cases occur sporadically, though occasional outbreaks of a small size are reported amongst the native population.

CHAPTER III.—GENERAL.

(1) Native Medical Units.

There are efficient native sections attached to the Government European hospitals throughout the Colony, and small native hospitals have recently been erected at Marandellas, Amandas, Plumtree, Fort Usher, Chibi and in the Chilimanzi Reserve, where there are no European hospitals. The larger mining companies maintain hospitals for their employees. The employed native who falls sick is thus on the whole well catered for. These, however, constitute a relatively small portion of a total estimated native population of 1,154,500. Over 800,000 natives live in reserves or on unalienated Crown lands. There are a limited number of medical missions which are subsidised by the Government.

The medical methods of the natives themselves are of the crudest character and often harmful. Experienced officers in the Native Department agree that the sufferings of the native in illness are extreme and are met with blank despair on the part of the patient. In order to deal with this problem, the Government recently instituted in the Ndanga-Bikita area a fully equipped native medical unit, and a second unit is in course of development for Mtoko and the surrounding reserves. The need for extension of native medical services, which have been so successfully organized on these lines, is strongly urged.

A description of the unit at Ndanga will demonstrate the efficiency and economy with which native medical units carry out their work. A doctor is stationed at Ndanga where a hospital block, consisting of a well-constructed operating theatre, sterilising room, outpatients' department and dispensary is being erected. Attached to these are 50 thatched brick huts for patients, to be increased to 70 during the present year.

These huts are erected at a very small cost. Each is capable of accommodating 8 patients. Subsidiary to the central institution are four small hospitals consisting of 20 to 30 huts, but without an operating block. These are in charge of trained native orderlies, and are at a distance of 30 to 60 miles from the central hospital. These sub-hospitals or dispensaries are visited by the doctor once a fortnight. They are so planned that they can be visited on a circular route of 211 miles, each tour occupying about 5 days. It is well known that the native will travel long distance to obtain medical assistance, and it is estimated that this organisation places medical assistance within the reach of 100,000 natives.

Close co-operation with the officers of the Native Department is essential and has been freely asked for and given. It is necessary that the personnel of native medical units should be not only efficient, but such as will attract confidence in the native. The selection of staff is therefore made with great care. Provided that the above essentials are carried out, the success of these units is surprising and at times embarrassing. The idea that the native is unwilling to accept European medicine can be discarded. Experience in the two native medical units shows that he is quite willing to undergo both medical and operative treatment, and further, is willing to entrust the treatment of maternity cases and young babies to European care.

Dr. Kennedy reports: Yaws is very prevalent in this district, a large portion of the population being affected. Grave mutilations of the skull and other bones occur in the later stages. Advanced tuberculosis is by no means rare, and is found among natives who have never left the district; suggesting that the disease occurs endemically among the native population. With the exception of broncho-pneumonia, which is common in children, pneumonia is seldom found, thus contrasting with natives in employment. Cases of cancer not infrequently come to our hospital. This contradicts the popular idea that malignant disease is rare among natives. Bilharzia is very prevalent. Numbers of cases of epilepsy come for treatment, some of whom have been so severely burnt that amputation of scorched limbs are necessary. Syphilis is common and is often associated with epilepsy. General paralysis of the insane is found, but locomotor ataxia is very rare. Untreated syphilitic disease results in serious damage to the eyes, not infrequently necessitating removal of the eye. Gonorrhœa constitutes only 5 per cent. of the total native venereal cases.

Malaria is widespread and many acute cases are treated in our hospitals. Towards the end of the rainy season it is difficult to find a child without splenic enlargement. Of the common infectious diseases, whooping cough is the most frequent.

Fear of general anæthesia is rapidly disappearing, and little difficulty is now experienced in persuading natives to under operations. In fact, at times it almost seems as if the pendulum were swinging the other way. The objection of native women to having babies treated in hospital has to a great extent disappeared. Further, native women are realising the beneficial results of treatment before childbirth.

The total cost of the Ndanga unit for the year, including maintenance, salaries, travelling expenses, etc., was £3,349.

At Mtoko Dr. Leggate combines the dual functions of Medical Superintendent of a large leprosy hospital as well as that of Medical Officer for the native medical unit for the Mtoko and surrounding reserves. The central native hospital is at Mtoko, and has been provided with an operating theatre, sterilising room, dispensary, etc. There is at present one subsidiary dispensary at Mrewa, forty miles distant. The work accomplished by this dispensary has grown rapidly since its institution, and it is hoped that at least one additional dispensary will be added to this unit during the coming financial year.

The following table gives the number of patients treated during the year at Ndanga and Mtoko native medical Units:—

Patients Treated in 1934.

	In-patients.	Out-patients.	Total.
Ndanga	5,140	7,021	12,161
Mtoko	923	7,756	8,679
	6,063	14,777	20,840

(2) NATIVE LABOUR ON MINES.

Disease.—Southern Rhodesia can be congratulated upon the reduction during recent years in the death rate from disease among native employees on mines, which in 1934 was the lowest on record in spite of the fact that the Colony employed a far greater number of native miners than in any previous year. That this reduction is the result of improved conditions and is not accidental is shown by the following facts. In the four years, 1926 to 1929, the death rate from diseases was 16.08 per thousand amongst an average number of 43,694 native employees. In the following four years, 1930 to 1933, the death rate from disease fell to 11.63 amongst an average number of 41,209 employees. In 1934 this rate was only 9.29 amongst an average number of 60,919 employees. There is no doubt that the owners of mines in Southern Rhodesia are humane and considerate to their native employees.

Pneumonia, the principal enemy of the native miner, shows the greatest diminution. It is hoped that improving hygienic conditions and increasing knowledge will combine to reduce further the death rate from this cause.

Accidents.—The death rate from accidents is practically stationary, having been for many years a little above the figure of 2 per thousand. Every such death is carefully enquired into, and it is probable that this rate is as low as can be anticipated in an occupation which contains unavoidable risks. The accident death rate for the Transvaal is about the same.

A senior officer of the Native Department is seconded for service on my staff, and devotes the whole of his time to supervising health conditions of native mine employees. The beneficial results of supervision by a skilled officer, who is in an entirely independent position, cannot be over estimated.

The following tables give details in regard to morbidity and mortality:

1. *Natives on Mines: Comparative Statement of Mortality,* 1930-1934.

	Twelve Months ended November				
	1930.	1931.	1932.	1933.	1934.
Average number employed	45,969	35,790	35,466	47,080	60,919
Disease—					
Number of deaths	692	477	341	438	566
Death rate per mille per annum	15.05	13.33	9.61	9.30	9.29
Accidents—					
Number of deaths	103	87	89	103	135
Death rate per mille per annum	2.24	2.43	2.51	2.19	2.22
All Causes—					
Number of deaths	795	564	430	541	701
Death rate per mille per annum	17.29	15.76	12.12	11.49	11.51

2. *Natives on Mines: Death Rates from Diseases.*

Death Rate per 1,000 Employed.	Twelve Months ended November				
	1930	1931	1932	1933	1934
Pneumonia	8.27	6.40	4.88	4.16	4.19
Other diseases	6.78	6.93	4.73	5.14	5.10
Total disease death rate ...	15.05	13.33	9.61	9.30	9.29

3. *Natives on Mines: Sickness, Deaths and Death Rates.*

Disease.	Twelve Months ended November		
	No. of Cases	No. of deaths.	Death rate per mille per annum.
Malaria	4,333	34	0.56
Scurvy	63	7	0.12
Syphilis	587	17	0.28
Pneumonia	1,143	255	4.19
Phthisis	53	35	0.57
Other diseases of chest	1,373	19	0.31
Dysentery	196	17	0.28
Diarrhœa	407	2	0.03
Other intestinal diseases ...	196	19	0.31
Heart disease	40	32	0.53
Debility	133	8	0.13
Influenza	7,921	35	0.57
Other diseases	2,151	86	1.41
Minor ailments	15,333	...	...
Total	33,929	566	9.29
Accidents and Injuries—			
Major	411	135	2.22
Minor	10,200	...	...
Total	44,540	701	11.51

(3) SPREAD OF DISEASE BY AIRCRAFT.

The danger of the introduction of communicable diseases by means of rapid transport in aircraft has been the subject of anxious consideration by the Governments of tropical countries during the last few years, and has been fully dealt with in my previous reports. Epidemiological history shows that from the earliest times diseases have taken root in new countries subsequent upon the opening up of new lines of traffic. The more rapid the transport the greater the danger, seeing that persons can leave their homes feeling well and arrive in a distant country within the incubation period of many formidable diseases. As far as South Africa is concerned, the greatest danger is in respect of yellow fever, which has for generations been endemic on the west coast of Africa, and which has recently been shown by the research workers of the Rockefeller Institute to extend further inland than had been realised.

It will be possible for individuals from these regions to board southbound aeroplanes and arrive in Southern Rhodesia in the early stages of this disease. Southern Rhodesia contains the necessary vector mosquito, *Aëdes ægypti* (*Stegomyia fasciata*). If yellow fever were allowed to take a footing among the native population it might be impossible ever to eradicate it.

The League of Nations have drawn up an International Convention detailing measures which it is considered will prove an effective check on conveyance of grave infections by aircraft without disturbing traffic arrangements. The Government of Southern Rhodesia, in common with the Governments of Great Britain and of most South African territories, have assented to the Convention, which is expected to be formally ratified before long. In the meantime, regulations are being drawn up by this department to give legal force to these preventive measures.

(4) School Medical Service.

During 1934, 4,746 children were examined at school medical inspections. Boys' schools were visited by Government Medical Officers, who examined 948 children, and the remainder were seen by the School Medical Officer.

Medical inspection is designed to detect disablement of any sort which would prevent the child from obtaining the maximum benefit from school education. In practice its scope extends considerably beyond this. During the year, 925 parents were present during the examination, and in each case the child's mode of life was discussed, its food, sleep, rest and individual difficulties were considered, and advice was given on many of the minor details of life which, taken in the aggregate, and over a number of years, would have a far reaching effect on the standard of physical fitness in the country.

Nutrition.—An investigation into nutrition was carried out by Dr. A. Clark on approximately 3,700 children. For this purpose the relation between height and weight was taken and checked by Dunston's scale, all children falling 12 per cent. or more below this scale being classified as subnormal. Malnutrition in children is not necessarily caused by deficiency in diet. It may also be caused by bad hygiene, fatigue, insufficient sleep and psychological maladjustment. The children who were classed as subnormal numbered 106, but in only 10 cases could poverty be brought forward as the primary cause. Nervous symptoms such as stammer, vomiting, jerky movements, disturbed sleep and emotional instability were noted in 23 cases. A history of malaria was obtained in 19, and of chronic tonsilitis in 11 cases. Recent recovery from illness explained the condition in 7 cases.

Mentally Retarded Children.—Children referred by teachers for special examination numbered 60. Of these 24 were classified as normal, 12 as border line cases, 18 as feeble-minded and 6 as imbeciles.

There are approximately 100 feeble-minded children attending schools in the country. In Bulawayo a special class is arranged at the Public School, which caters for about 15, and the remainder are graded as far as possible with the duller children in ordinary schools.

Enlarged Tonsils.—The number of children found with enlarged tonsils remains high. The irritation of fine dust has been suggested as a contributory cause. Operation is advised only in those cases where (1) there are fairly frequent recurrences of tonsillitis, or (2) when there is the syndrome of nasal discharge, mouth breathing and deafness, or (3) where deafness occurs during a "common cold," or (4) where the tonsils are pitted and there are signs of chronic toxæmia. In the majority of cases seen, the treatment consists of saline gargles during the dry season.

Cases Recommended for Treatment, 1934.
4,746 Children Examined.

	Number referred for treatment.						
	Group 1.	Group 2.	Group 3.	Group 4.	Group 5.	Group 6.	Total.
	Entrants.	First Intermediates.	Second Intermediates.	Leavers.	Re-examination.	Specials.	
Bilharzia	...	1	1	3	1	1	7
Skin—							
Impetigo	1	...	1	...	3	...	5
Ringworm	...	...	...	...	...	...	...
Veld sores	...	...	...	...	1	...	1
Other diseases ...	8	2	3	1	5	...	19
Eye—							
Blepharitis	...	...	...	...	1	...	1
Conjunctivitis ...	3	2	1	1	...	...	7
Defective vision	8	5	12	15	19	1	60
Squint	2	...	...	2	...	...	4
Other conditions	...	...	1	2	1	...	4
Ear—							
Defective hearing	13	4	4	9	14	...	44
Otitis media ...	2	...	2	...	3	...	7
Other ear diseases	...	...	...	...	1	...	1
Nose and Throat—							
Enlarged tonsils	43	20	23	15	34	...	135
Adenoids	1	...	...	...	1	...	2
Enlarged tonsils and adenoids ...	3	1	3	1	...	1	9
Mouth breathers	31	12	12	8	14	1	78
Defective speech	1	...	...	...	...	...	1
Other defects ...	12	3	3	2	3	...	23
Heart—							
Organic disease	...	1	1	...	1	...	3
Functional disease	2	1	...	...	...	...	3
Anæmia	4	1	4	4	6	1	20
Lungs—							
Bronchitis	...	...	...	...	...	...	...
Other non-T.B. diseases	...	...	2	...	...	...	2
Tuberculosis—							
Lungs	...	...	...	...	...	...	...
Other	1	...	...	...	...	...	1
Nervous System—							
Chorea	1	...	...	...	...	...	1
Epilepsy	...	...	...	...	...	...	...
Other conditions	6	...	3	2	4	...	15
Spleen—							
Enlarged	9	3	5	...	9	...	26
Slightly enlarged	1	...	3	3	7	...	14
Other diseases and defects	17	7	9	20	20	...	73

Postural Defects, 1934.

	Number referred for Treatment :		Number requiring to be kept under Observation :		Total Defects.
	Boys.	Girls.	Boys.	Girls.	
Flatness and poor expansion of the chest wall ...	17	2	...	...	19
Round shoulders	19	3	1	2	25
Curvature of the spine ...	4	4	...	2	10
Pigeon chest	2	1	...	...	3
Other deformities	11	8	5	6	30

(5) WORK OF GOVERNMENT DENTAL SERVICE.

The Government employ two whole-time Dental Surgeons, one for the eastern division of the country with headquarters at Salisbury, and one for the western division with headquarters at Bulawayo. There is a clinic at both these centres.

Their work has been organised by Mr. Woodcock, the Senior Government Dental Surgeon, and includes (1) the examination of school children and the treatment of the poorer cases; (2) dental treatment of the B.S.A. Police and Permanent Staff, Defence Force; (3) dental treatment of European patients at Ingutsheni Mental Hospital. Urgent cases among prisoners are dealt with. As opportunity arises, a limited number of pauper patients are treated. This is done as a charitable act, it being impossible for any Government to undertake the treatment of all pauper dental patients.

Summary.

	Salisbury Division.	Bulawayo Division.	Total.
Total number of patients treated (excluding paupers)	879	641	1,520
Total number of extractions	1,904	1,192	3,096
Total number of fillings	1,388	1,269	2,657

Dental Treatment: *B.S.A. Police.*

	Salisbury Division.	Bulawayo Division.
No. of patients	242	108
No. of fillings (perm.)	336	155
No. of fillings (temp.)	58	...
No. of extractions	89	69
No. of scalings	70	51
No. of gold fillings	10	1
Other operations	88	40
Pauper Patients, Prisoners and Mental Hospital.		
No. of extractions	370	441
No. of fillings	57	70
No. of other operations	...	8
School Dental Service.		
No. of children examined	1,946	3,183
No. of children treated	637	533
No. of Fillings—		
Temporary teeth	127	294
Permanent teeth	810	750
No. of Extractions—		
Temporary teeth	1,162	565
Permanent teeth	283	117
No. of other operations	158	113

(6) Health of the B.S.A. Police.

European.—During the year the number of cases receiving attention for illness or injury was 991, necessitating abstention from duty for 4,900 days, and light duty for 3,729 days. This shows an increase of 167 cases compared with last year.

The case incidence of malaria has decreased, being 127 cases as compared with 160 last year. There have been no cases of blackwater fever. The use of atebrin has proved very successful in malaria. An outbreak of enteritis occurred during the months of October and November, which appeared to be confined to the Police Camp area and was considered to be fly-borne in origin. The cases were mild and cleared up rapidly with treatment. The average number of days lost per man was about three. This year one case of enteric fever, in a man who had never been inoculated, was reported in the Hartley district. Injections of T.A.B. vaccine have greatly decreased the incidence of this disease, and the value of routine immunization of all new members of the force, as now carried out, is strongly emphasised.

There were two discharges as medically unfit during the year, and one death due to gunshot wound.

Natives.—There was a decrease in the number of cases receiving treatment from 1,428 in 1933 to 1,301 in 1934, and a decrease to 6.42 in the number of days lost per case, which is partly accounted for by the fact that this year "light duty" has been counted as a half day off instead of a full day as previously. Influenza, enteritis and dysentery were responsible for the major proportion of sickness this year. The incidence of venereal disease has decreased to 66 as compared with 76 last year; syphilis accounting for 68 per cent. of the cases. Hartley and Gwelo districts were the chief centres of these diseases. There were three native deaths recorded during the year.

General.—Taking the estimated average strength for Europeans as 509, the number of days lost per man was 13.2; for the 916 native troops the corresponding figure is 9.1. In estimating these figures light duty has been taken as being equal to a half day off duty.

(7) Mental Disease.

The re-organisation of the Government mental hospital at Ingutsheni, consequent upon the appointment of an experienced whole-time medical superintendent, has been continued throughout the year. The necessary changes will take some time to complete and are being effected as rapidly as possible.

The European female block, which is a comparatively modern building, has been added to and improved. The old European male block is still in use but is unsatisfactory. Plans are being prepared for the erection of a new block for this purpose. The modern practice of occupational therapy has been instituted by the appointment of a whole-time instructor and a part-time instructress. The monotony of the lives of the patients has been improved in other directions. The Bulawayo branch of the Toc H. supply a fortnightly cinema at the hospital. In addition, suitable patients are taken weekly to a cinema in the town, and also to football and cricket matches during the week-ends. In this connection thanks are due to the Empire, Prince's and Palace Cinemas and to various sports associations.

A Bill has been drafted to bring the law relating to mental disorders into line with modern conceptions, which will include provision for admission of temporary cases to the mental hospital without certification, thus facilitating the early treatment which is of such importance and which has hitherto been hampered by the not unnatural horror with which both patients and their relatives regard certification. This Bill will also include provision in regard to mentally deficient persons, certain classes of whom are not included in the existing Ordinance of 1908.

The question of making suitable separate provision for mentally deficient patients, including children, is being carefully investigated. At present the only method of catering for such persons is to send them to institutions in the Union.

Dr. Rodger reports as follows:—Of 115 cases discharged, 107 were recovered, 8 relieved and handed over to the care of relatives. The recovery rate, calculated on the number of admissions for the year was 79.85 per cent., European recoveries being 40.54 per cent. and native recoveries 96.98 per cent. The European recovery rate is slightly above normal. The native recovery rate is surprisingly high, and is unlikely to be repeated. Liberation on probation was allowed in ten cases. Two broke down and were returned to hospital before the completion of the probationary period. Three recovered and five have not yet completed probation. The general health of the hospital has been excellent. The diet has been further balanced and adjusted, with the result that the European patients have gained an average of 1.6 pounds, and the native patients an average of 5 pounds. The teeth of all the patients have been examined by the Government Dental Surgeon, who gave any treatment required by European patients.

Revenue from paying patients amounted to £2,317 3s., and various sales to £78 9s. 4d. In addition, supplies from farm and garden to the hospital amounted in value to £757—total £3,152 12s. 4d. The total expenditure was £12,416. The net cost to the Government after deducting total revenue was 1s. 6d. per patient per diem.

CHAPTER IV.—HOSPITALS AND LABORATORIES.

(1) Hospitals.

In Southern Rhodesia the Government provide hospitals for the sick poor, and also for private patients who, in other countries, would receive less efficient service at a greater cost in proprietary nursing homes. Such an arrangement is most advantageous to the public, but necessarily adds considerably to the size and cost of Government hospitals.

Expenditure on general hospitals, not including salaries of Government Medical Officers, was £107,623 in 1934. Revenue received was £31,160. The Government thus bore 71.5 per cent. of the cost.

Of a total of 6,574 European patients only 1,650, or 25 per cent., were free patients. It is thus clear that the Government are bearing a very large proportion of the cost of treating paying patients.

The year 1934 saw new records created both in the number of admissions to Government hospitals and in the number of outpatients attending. The admissions and outpatient attendances during recent years can be seen in the following tables:—

Admissions.

	1930.	1931.	1932.	1933.	1934.
Europeans	5,272	5,093	5,369	5,822	6,264
Natives	8,180	7,466	7,924	10,057	10,727
	13,452	12,559	13,293	15,879	16,991

Out-Patients.

	1932.	1933.	1934.
Europeans	8,594	8,996	10,135
Natives	13,487	13,563	27,273
	22,081	22,559	37,408

Salisbury Hospital.—There has been a general increase of work this year. At 2,525 European admissions during the year this hospital shows an 8 per cent. increase on last year's record number of admissions. European outpatients numbered 4,234, an increase of 335 on last year. The total number of operations performed was 1,524, of which 425 were classed as major and 1,099 as minor. The corresponding figures for last year are 466 and 1,059. In the X-ray Department 1,347 cases were investigated, an increase of 125 cases as compared with last year. The native admissions were 1,757, which is a record, as also is the number of native outpatients at 4,633, an increase of 698 on last year's figure. Plans are in progress for the construction of a new block to contain a new radiological department, an operating theatre suite, a physio-therapeutic department, and new casualty and outpatient accommodation.

Memorial Hospital, Bulawayo.—The number of European admissions to the hospital is still continuing to rise, being 1,813 for the year, an increase of 74 on last year's figure. The number of native admissions has also increased to a total of 2,475 for the year, an increase of 499 over last year. In the outpatient department even more striking increases are to be noted. The European attendances were 4,838, an increase of 1,021, and the native attendances were 9,834, an increase of 4,114. In the X-ray department there were 1,047 cases investigated, an increase of 163 as compared with last year. The operations on Europeans total 1,137, of which 323 were classed as major. The corresponding native figures were 512 and 95.

There has been no increase in accommodation in the hospital during 1934. In view of the impending removal of the hospital to a new site, the work which has been done on the fabric during the year has been purely maintenance. In the European hospital the average number of beds occupied each night was 78 per cent. of the available accommodation, and in the native hospital the corresponding figure was 92.3 per cent. These figures are very high, and point more than ever to the necessity for the completion of the new hospital.

Umtali Hospital.—The work this year at Umtali Hospital has been maintained at a high level, the total admissions being 1,030 as compared with 1,061 last year. Of the total 420 were Europeans, 94 of whom were admitted for malaria. There were two European cases and one coloured case of blackwater fever. There was a number of severe cases of pneumonia this year, with a high mortality. Of nine European cases seven died, and of the 28 native cases eight died. Other diseases appeared to be normal in incidence and mortality.

Gwelo Hospital.—Of the 1,160 total admissions, 381 were Europeans and 779 were natives. This shows a decrease of 11 in the number of European admissions compared with last year, and an increase of 134 native admissions. In the outpatient department 440 European and 1,278 native attendances were recorded. This shows a decrease of six Europeans and an increase of 64 native attendances.

The new native hospital, opened on the 27th March by H.R.H. the Duke of Kent, has caused an increase in the number of native admissions and outpatient attendances.

Gatooma Hospital.—Total admissions to the hospital this year were 483 Europeans and 954 natives, these figures showing a considerable increase of work. There were 168 operations performed, of which 39 were classed as major. There were 21 European deaths this year, blackwater fever taking the largest toll of four cases. Disease of the respiratory system came second with three cases.

Fort Victoria Hospital.—There has been an increase in both European and native admissions this year, the total number being 558, of which 164 were Europeans. Last year's total admissions were 472, so work has increased here considerably.

Sinoia Hospital.—The number of European admissions was less than 1933 by 18, but the native admissions have increased to 562 from 519 last year. Outpatients, both European and native, have increased this year, being 154 and 352 respectively, as compared with 107 and 113. There were 68 operations performed this year, of which 15 were classed as major. Nine European deaths and 47 native deaths were recorded.

The new maternity block, opened towards the end of 1934, dealt with two cases before the beginning of 1935, and promises to be useful.

Enkeldoorn Hospital.—Both European and native admissions have increased, the numbers being 171 and 625 respectively, as opposed to 126 and 445 in 1933. The new nurses' home is proving comfortable and satisfactory.

Shamva Hospital.—During the year there were 654 admissions to hospital, 63 of which were European and 591 native. The corresponding figures for last year were 56 European and 503 native, which shows a general increase in the work of the hospital. There were 91 outpatients this year as opposed to 97 last year. Of the number of outpatients attending ten were native.

Gwanda Hospital.—The European admissions have greatly increased this year, being 82 as compared with 37 in 1933. The native admissions have decreased from 597 to 581. Pneumonia was the most serious disease this year, there being 38 cases. The new native hospital has been in full use during the year.

(2) LABORATORY SERVICES.

(1) *Public Health Laboratory and Pasteur Institute, Salisbury.*

The routine examinations for the year number 18,087, an increase of 1,400 on the examinations carried out in 1933.

BACTERIOLOGY:

Fæces, European.—A bacteriological examination was made of 200 specimens of stool. In view of the fact that acute bacillary dysentery accounted for 13 out of a total of 441 European deaths in 1933, an attempt was made during 1934 to obtain stool samples from cases of acute bacillary dysentery in a state suitable for detailed bacteriological examination, and during the past dysentery season it was found that the chief organisms concerned were *B. dysenteriæ* Shiga, and *B. dysenteriæ* Flexner. Thus *B. dysenteriæ* Shiga was isolated on 7 occasions, *B. dysenteriæ* Flexner 4 times, *B. dysenteriæ* Hiss and *B. dysenteriæ* Dispar once only. In each instance the cultural findings were confirmed serologically. The following organisms were isolated from cases presenting features of gastro-enteritis or severe diarrhœa:—*B. ærtryke*, 3; *B. alkaligenes*, 3; *B. proteus asiaticus*, 1; *B. morgani*, 1; *B. typhosum*, 1; *B. pyocyaneus*, 1. *Natives*—73 specimens of stool were examined bacteriologically, and the following organisms isolated:—*B. dysenteriæ* Shiga, 7; *B. dysenteriæ* Flexner, 1; *B. proteus asiaticus*, 1; *B. morgani*, 2; *B. alkaligenes*, 1.

It will be noted that the bacteriological findings in both European and native cases of dysentery show a preponderance of Shiga infections. In the past Flexner dysentery, or dysentery attributable to infection with one of the paradysentery groups of organisms, has been the usual experience, hence the sudden appearance of Shiga dysentery suggests the introduction of a Shiga "carrier" into the community from which the current findings have been derived. In regard to infections with *B. dysenteriæ* Flexner, the "V" strain occurs with greatest frequency. Occasionally a "Y" strain is isolated.

Urines, Europeans.—A full bacteriological examination was carried out on 462 catheter or mid-stream specimens of urine, and *B. coli* or some member of the coliform group of organisms isolated on 166 occasions. In several cases in which positive cultural results were obtained there was a complete lack of cytological evidence of bacterial infection of the urinary tract, indicating that a full urine analysis is necessary before attempting to assess the clinical significance of coliform organisms in the urine, but, as stated in a previous report, a high incidence of urinary sepsis prevails amongst adult European females. *Natives.*—50 specimens of urine were submitted for bacteriological analysis, and *B. coli* demonstrated in 6.

Blood Cultures.—Blood culture was carried out on 37 occasions, and the following positive results obtained:—*B. typhosum*, 7; *B. alkaligenes*, 8. The frequency with which *B. alkaligenes* was detected is of special interest. On one occasion a definite outbreak of *B. alkaligenes* septicæmia occurred amongst a group of natives on a mine compound. The condition was variously diagnosed as typhus fever and paratyphoid fever until the isolation of the causative organism in pure culture from the blood revealed the true state of affairs. Several fatal cases occurred in the course of the outbreak. Amongst Europeans it gives rise to an enteric-like condition associated with a profuse rash which presents many features in common with the rash of Rhodesian tick typhus. In one European case pneumonic symptoms developed in the course of the disease, and *B. alkaligenes* was isolated from the sputum. This case terminated fatally.

Throat Swabs.—703 throat swabs were examined from cases of suspected diphtheria, and Klebs Loeffler bacilli were cultured on 59 occasions. It is of interest to note that out of 100 throat swabs received from native cases of suspected diphtheria, a positive cultural result was obtained in 8. Although virulence tests were not carried out, in 2 cases the evidence showed that the natives were suffering from clinical diphtheria.

Sputa.—474 specimens were examined for tubercle bacilli (Europeans 392, natives 82). In most cases the material was concentrated by the antiformin method. Positive results were obtained as follows:—Europeans, 111; natives, 10. The high incidence of positive results obtained from the European specimens is accounted for by the fact that repeated examinations are carried out on cases of active pulmonary tuberculosis resident in the Salisbury Hospital.

Urethral and Cervical Smears.—312 smears were examined (Europeans, 234; natives, 78) and gonococci found in 107 (Europeans, 79; natives, 28).

Leprotic Material.—The bulk of the material examined for *M. lepræ* is received from the Mtemwe Leper Settlement in the form of skin snippings or nasal scrapings. 214 such specimens were examined and *M. lepræ* demonstrated in 53.

Cerebro-Spinal Fluids.—56 specimens were examined bacteriologically and pathogenic organisms isolated from 35, as follows:—*Meningococci*, 24; *B. influenzæ*, 6; *Streptococci*, 2; *Pneumococci*, 1; *Staphylococci*, 2. As in previous reports, meningococci were again the chief causal agent of meningitis amongst natives, but it is of interest to note that cases in which *B. influenzæ* was isolated from the cerebro-spinal fluid occurred with greater frequency than usual. Of the 6 cases recorded, 2 were European children and 4 were adult natives, and in conformity with experience elsewhere, all the cases terminated fatally.

Pleural Fluids.—5 specimens only were examined, and the following results obtained:—*Staphylococci*, 3; *Staphylococci* and *Bacillus of Friedländer*, 1; *Pneumococci* and *Bacillus of Friedländer*, 1.

Water and Milk.—A bacteriological examination of 49 samples of water and 21 samples of milk was carried out during the year.

Vaccines.—97 autogenous vaccines were prepared and issued in the course of the year.

SEROLOGY:

Agglutination Tests.—Agglutination tests were carried out on 484 samples of serum (Europeans, 250; natives, 234), and diagnostic titres obtained with the various antigens as follows:—*B. typhosum*, Europeans 57, natives 48; *B. paratyphosum A*, Europeans 6, natives 10; *B. paratyphosum B*, Europeans 3, natives 8; *Brucella* antigen, Europeans 4, natives 0; *B. alkaligenes*, Europeans 2, natives 2.

It has long been realised that enteric fever is endemic in the Colony, and, as the laboratory returns show, it is encountered in variable numbers from month to month. The available evidence suggests that the continued endemicity of the disease is largely due to (1) the existence of "carriers," chiefly native "carriers," (2) the fact that natives suffering from this disease tend to continue in their occupation until the disease is well advanced, and (3) the frequency with which comparatively mild—even ambulatory—cases are met with, particularly amongst natives. Consequently a community largely unprotected by T.A.B. inoculations is frequently exposed to the risk of infection. Towards the end of the year a sharp rise occurred in the incidence of typhoid fever amongst natives and Europeans, as the following figures indicate:—

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
No. of diagnostic titres	6	10	7	10	12	3	6	9	3	3	22	11

An exhaustive search was made in order to detect a "carrier," and, by means of preliminary agglutination tests, a native urinary "carrier" was found in the boarding house in which the initial cases occurred. Subsequently, 5 potential "carriers" were detected serologically.

Weil Felix Test.—118 samples of serum were submitted for the Weil Felix test and 43 positive results returned. This test is employed mainly in the diagnosis of tick typhus, and while it is of restricted diagnostic value in the early phases of the disease, by the 7th to 10th day of the illness significant titres can be obtained.

Complement Fixation Tests.—The Wassermann test was carried out on 1,545 specimens of serum (European 227, natives 1,318), with the following results:—*Positive*: European, 50; natives, 541. *Negative*: European, 162; natives, 694. *Doubtful*: European, 15; natives, 83.

PATHOLOGY:

Post-mortem Examinations.—189 post-mortem dissections were performed during the year—clinical, 108; medico-legal, 81.

An analysis of the principle causes of death amongst native cases shows the following results:—Lobar pneumonia, 30; acute bacillary dysentery, 21; typhoid fever, 11; cerebro-spinal meningitis, 10; pulmonary tuberculosis, 7; pneumococcal meningitis, 5. The following cases of special interest were encountered in natives:—Abscess of thymus gland, 2; coronary thrombosis, 1; multiple subendocardial abscesses of left ventricle of heart secondary to lobar pneumonia, 1; primary cancer of liver, 4; cancer of urinary bladder, complicating genito-urinary bilharziasis, 2; subarachnoid hæmorrhage, 1; cerebral malaria, 1; plasmoquin poisoning, 1. The latter case occurred after 0.06 gm. of Plasmoquin simplex taken in conjunction with atebrin over a period of 48 hours but without medical supervision.

Histological Examinations.—The specimens reported on numbered 157. The bulk of the tissues submitted was derived from surgical cases, but a certain amount was obtained from post-mortem material. It is not proposed to make a full analysis of the results of the histological examinations, but in view of the fact that in 1933 malignant diseases occupied second place amongst diseases of the Colony causing European deaths, the incidence of malignant disease amongst routine European specimens is of interest. Thus malignant disease was reported as follows:—Carcinoma: of cervix and uterus, 11; of lip, 4; of breast, 4; of prostate, 2; of tongue, 1; of prepuce, 1; of ovary, 1; of testes, 1. Basal cell carcinoma, 2; malignant melanoma, 1; sarcoma, 2.

PARASITOLOGY:

Fæces.—The number of stool specimens examined during the year amounted to 893. *European* specimens: 491. *Protozoa*: *Giardia lamblia*, 12; *Entamœba histolytica*, 14; *Iodamœba bütschlii*, 4. *Helminths*: *B. mansoni*, 6; *B. hæmatobium*, 1; *Tænia spp*, 1; *Oxyuris vermicularis*, 2; *Trichuris trichiura*, 2; *Ascaris lumbricoides*, 2.

Native specimens: 402. *Protozoa*: *Giardia lamblia*, 21; *Entamœba histolytica*, 20; *Iodamœba bütschlii*, 8. *Helminths*: *B. mansoni*, 43; *B. hæmatobium*, 4; *B. mattheei*, 1; *Tænia spp*, 5; *Hymenolepis nana*, 2; *Trichuris trichiura*, 2; *Strongyloides stercoralis*, 3; Hookworm, 66; *Ternidens deminutus*, 3.

The chief point of practical interest in connection with the parasitological returns for the year is the increased frequency with which *E. histolytica* has been demonstrated both amongst natives and Europeans. It was formerly believed that amœbic dysentery was relatively uncommon in this country, and the laboratory returns of former years appear to support this belief In 1932, *E. histolytica* was reported on 3 occasions only, in 1933 on 8 occasions, whereas this year the parasite has been demonstrated 34 times. The apparent increase in the incidence of amœbic dysentery is probably explained by the fact that it is now the common practice to submit dysentery cases to full laboratory investigation before instituting treatment, and secondly the increased care with which specimens are collected from hospital cases has also materially affected the number of positive reports. Another point of interest is that bilharzial infections of the intestinal tract are being met with amongst Europeans with increasing frequency. In most cases the discovery is made in the course of a routine parasitological examination, although on close investigation of the patient's clinical history, a history of bowel disturbance, either recent or remote, can be elicited in a good many cases.

Urine.—A parasitological examination of 1,586 specimens was made in the course of the year. The incidence of *B. hæmatobium* amongst urine specimens received from Europeans (adults as well as children) amounted to 5 per cent. Amongst a mixed native population the incidence was 23 per cent. The corresponding percentages for the previous year were:—Europeans 6.8 per cent. and natives 24 per cent.

Blood.—Plasmodia: 1,387 blood films were examined, European, 1,091; native, 98. *P. falciparum* was demonstrated in 159 films from Europeans and in 36 from natives. *P. vivax* was found on 3 occasions only. *P. falciparum* continues to be the dominating species affecting both natives and Europeans.

Trypanosomes: *T. rhodesiense* was demonstrated on one occasion in an adult male European who had travelled through one of the recognised foci of human sleeping sickness in the country. This case is of special interest, in that when treatment was instituted trypanosomes were demonstrated both in the blood and in the cerebro-spinal fluid. A course of treatment consisting of 4 grammes of Bayer 205, followed by 40 grammes Tryparsamide, has not been marred by any evidence of relapse after an interval of eleven months.

Filaria embroes: *F. perstans* was demonstrated on 6 occasions. In certain parts of Rhodesia this filaria occurs with great frequency amongst the indigenous natives, where it appears to exist as a harmless commensal.

Biochemistry:

A further increase in specimens received for biochemical examinations occurred during the year. A total of 652 specimens were examined, as against 482 in the previous year.

Blood Analyses.—441 analyses were made as follows:—Sugar (Folin), 71; Sugar Tolerance Tests, 35; Urea, 48; Non-protein nitrogen, 44; Bilirubin, 14; Hæmoglobin, 211; Calcium, 15; Inorganic phosphates, 1; Cholesterol, 1. *Gastric Contents.*—87 fractional test meals were examined. Hyperchlorhydria was demonstrated in 19, hypochlorhydria in 3, achlorhydria in 9, and a normal acid response in 44. It is frequently found that in cases presenting clinical features of juxta-pyloric ulcer, evidence of marked pylorospasm in the test meal findings is shown, but no radiological evidence whatsoever of ulceration of the gastro-duodenal mucosa can be demonstrated. Such cases of functional pylorospasm occur with considerable frequency and invariably respond to medical measures. *Urine analyses.*—108 samples of urine were examined, as follows:—Urea, 10; Urobilin, 56; Bile pigments, 21; Quinine, 25; Spectroscopic examination for hæmoglobin derivatives, 15. The Urea Clearance Test was carried out on one occasion. In addition, 15 specimens of cerebro-spinal fluid were examined, and 4 specimens of fæces were tested, 2 for occult blood and 2 for fatty acids and neutral fats. Finally, 1 specimen of blood-stained fluid was submitted for identification and was found to consist mainly of grossly contaminated human blood.

Clinical Pathology:

As a consequence of having drawn attention to the frequency of "anæmia" amongst the European population there has been a steadily increasing demand for blood counts. A total of 360 blood counts were carried out in the course of the year, together with 148 total white cell counts.

As previously stated, "anæmia" is frequently met with amongst Europeans of some years' residence in this country. Females are more frequently affected than males. While cases of true megalocytic anæmia are met with from time to time, the prevailing type is a nutritional anæmia which as a rule responds well to suitable therapy. It appears, however, that these cases do not respond to iron alone, but require careful dietetic adjustments, mainly in the direction of increased protein and vegetable intake. The impression has been formed that a considerable proportion of cases of nutritional anæmia met with in females is a direct sequel to self-imposed dietetic restrictions. Furthermore, this type of anæmia appears, in some cases at least, to be aggravated by pregnancy, and it is suggested that in addition to careful attention to the urine, blood pressure, etc., periodic blood examinations should be carried out during the gestation period. Two cases of agranulocytic angina were encountered during the year. In the first case the patient complained of a sore throat, and although a few K.L.B. were demonstrated, no improvement followed the exhibition of anti-diphtheritic serum. The suggestion was made that the case was probably one of agranulocytic angina and confirmation was obtained by hæmatological examination. The red cells numbered 4,210,000 per c. mm., but the white cells had fallen to 600 per c. mm., with a complete absence of neutrophiles. In spite of vigorous nuclein therapy the patient died. The second case occurred as a complication of typhoid fever. About the third week of the disease the patient developed jaundice, a sore throat, and a general exacerbation of symptoms. The hæmatological findings at this stage showed 1,200 white cells per c. mm., with only 4 per cent. neutrophiles. The white cells fell rapidly to 500 per c. mm. and the neutrophiles disappeared completely from the peripheral circulation. This case also ended fatally.

Reticulocyte Counts.—39 reticulocyte counts were carried out during the year. While the value of the reticulocyte count in determining and controlling the therapeutic efficiency of liver therapy in the megalocytic anæmias is well established, a series of studies on the reticulocytes in blackwater fever conducted in this laboratory have shown that with the cessation of hæmolysis in blackwater fever a vigorous reticulocytosis occurs, the presence or absence of which has an important bearing on prognosis. The position may be summarized by saying that in the absence of complicating factors such as myocardial failure and anuria, a rising reticulocyte count means a good prognosis.

Blood Grouping and Blood Transfusions.—The blood group was ascertained on 25 occasions. Frequent calls continue to be made on the Blood Transfusion Service, the membership of which has now risen to 77 members. Blood transfusion is made chiefly in connection with cases of blackwater fever, where it now holds an established place as a valuable therapeutic measure. A total of 18 transfusions was arranged for during the year.

Urine.—A chemical and cytological examination was carried out on 1,283 specimens of urine (European 936, natives 347).

SKIN TESTS:

Schick Tests.—This test was carried out on 102 occasions, and 38 positive reactions obtained. *Mantoux Tests.*—18 Mantoux Tests were made during the year and 8 positive reactions obtained. The initial injection as a rule consists of 1: 1,000 dilution of Old Tuberculin in phenolized saline, but, where necessary, the dilutions are modified. *Protein Sensitization Tests.*—Using the seven stock extracts supplied by the South African Institute for Medical Research, cutaneous sensitization tests by the scarification method were carried out on 35 occasions, chiefly on individuals suffering from hay fever or asthma. A positive reaction was obtained on 18 occasions. The frequency with which the various extracts gave positive results is as follows:—Mixed Compositæ, 7; Mixed Grasses, 6; Wild Als, 1; Mimosa Tree, 1; Orris Root, 1; Mixed Animal Epidermis, 2. It will be noted that the pollens of grasses and flowers of the order Compositæ are responsible for a considerable proportion of cases of hay fever in this country. Such cases, as a rule, respond satisfactorily to careful courses of treatment with the homologous extract.

BIOLOGICAL TESTS:

Tuberculosis: 12 guinea-pig inoculations were carried out, and 2 positive results obtained. Trypanosomiasis: 19 white rat inoculations were made from suspected cases of trypanosomiasis, and 3 positive results obtained.

PASTEUR INSTITUTE REPORT:

Thirty-one courses of anti-rabies vaccine were issued during the year and 2,000 c.c. of vaccine prepared. One dog suspected to be rabid was received from the Marandellas district. The brain was examined directly and two rabbits inoculated intracerebrally, but no evidence of rabies infection was obtained.

ADDITIONAL WORK:

(1) Immunization against diphtheria continues to be much sought after, and during the year 121 children and young adults were immunized at the Laboratory, and 291 "sets" of diphtheria anatoxine issued. An immunizing course of injections against enteric fever was given to 11 individuals, using the "T.A.B." vaccine prepared by the South African Institute for Medical Research. Four courses of "Fouadin" were administered to children suffering from urinary bilharziasis.

(2) On account of the relative frequency with which parasitic infections are detected in Europeans in the course of routine laboratory investigation, a short memorandum was prepared drawing attention to the fact, and to the deleterious effect of such infections on the health of the individual. Through the kindness of the Chief Native Commissioner this memorandum was circulated amongst the (European) members of his staff, who were thus given the opportunity of having samples of urine, fæces and blood investigated free of charge in this Laboratory. The results obtained to date are as follows:—Samples of urine, fæces and blood (in the form of a blood film) have been received from 17 members of the Native Department, and the following parasitological findings have been obtained:—Helminths: *B. mansoni*, 3; *Tænia saginata*, 1; *Ascaris lumbricoides*, 2. Protozoa: *Entamœba histolytica*, 1; *P. falciparum*, 1.

On the data available, evidence of parasitic infection was detected in 41 per cent. of the group examined. The figures are, of course, of limited statistical value, but they serve to show that in the case of individuals whose work takes them out into native reserves and into places where the sanitary arrangements are necessarily of a primitive character the risk of acquiring parasitic infections is fairly considerable, and that such individuals should be subjected to a full parasitological examination at least twice a year.

(3) During 1934 Mr. H. S. Leeson, of the London School of Hygiene and Tropical Medicine, carried out some field investigations on the distribution of *Anopheles funestus* (Giles) and *Anopheles gambiæ* (Giles), the main vectors of *P. falciparum* in this country. Both species were found in proximity to Salisbury, and in order to ascertain the extent to which these mosquitoes were liable to become actual vectors of *P. falciparum*, a search for gametocyte carriers was made amongst the native children in (1) the Salisbury Native Location and (2) the Native Police Location. The following results were obtained:—

	Native Location.	Police Location.
Total No. of films examined	200	30
Ring forms of *P. falciparum* ...	11 (5.5%)	...
Gametocytes of *P. falciparum* ...	3 (1.5%)	1
Rings and Gametocytes	1 (0.5%)	...

These figures were obtained just before the onset of the rainy season and show that in the Salisbury Native Location alone 7.5 per cent. of the native children were either actual or potential gametocyte carriers.

(4) An attempt was made during the year to ascertain the frequency and concentration of agglutinins for the typhoid-paratyphoid bacilli and for the Brucella group of organisms in normal members of the population. For this purpose samples of serum submitted to the Laboratory for the Wassermann Test were titrated against standardized formolized suspensions of *Bact. typhosum*, *Bact. paratyphosum A.* and *B.* and *Br. abortus*. No attempt was made to differentiate between somatic and flagellar agglutinins, but it is proposed that during the future stages of the investigation that this differentiation shall be made. Again no information can be given concerning the relative numbers of inoculated and uninoculated members in the group examined, except that so far as the native figures are concerned they may be taken to represent the findings in an uninoculated community. The results in outline are as follows:—

Bacterial Suspension.	No. of Sera.	No. Positive.
EUROPEANS:—		
B. typhosum	77	6
B. paratyphosum A.	77	...
B. paratyphosum B.	77	...
Br. abortus	140	...
NATIVES:—		
B. typhosum	530	67
B. paratyphosum A.	530	...
B. paratyphosum B.	530	...
Br. abortus	1,050	1

It is not proposed to discuss these findings in detail, but the high incidence of *B. typhosum* agglutinins amongst the native population is in accord with the endemicity of the disease, and, secondly, the low incidence of *Br. abortus* agglutinins amongst natives and Europeans alike bears eloquent testimony of the low invasive powers possessed by the Rhodesian strain of *Br. abortus* for the human host.

PUBLICATIONS:

The following papers were published by members of the Laboratory Staff during the year:—

1. BLACKIE, W. K.—"Agranulocytosis Complicating Typhoid Fever." *Lancet*, 1934, Vol. 2, 355-356.
2. BLACKIE, W. K.—"The Reticulocytes in Blackwater Fever." In the Press.
3. ALVES, W. D.—"Bacillary Dysentery in Salisbury, S. Rhodesia." *South African Med. Journal*, 1934, Vol. VIII., No. 22, 835-836.
4. KITTO, W. H.—"Rapid Determination of Nitrogen by a Kjeldahl Nessler Process." *The Analyst*, Vol. 59, No. 704, 733-735.

W. K. BLACKIE, M.D.,
Director.

(2) Report of the Director, Bulawayo Bacteriological Institute.

Dr. G. R. Ross reports as follows:—

The number of specimens examined during 1934 amounted to 2,412, as contrasted with 2,035 in 1933. Work undertaken has been purely of a routine nature, as in former years, but it is hoped that an extension of the activities of the institute will be possible during the coming year. The distribution among the various contributing authorities was as follows: Government, 1,155; Railways, 371; Municipality, 34; Private, 852.

Malarial parasites were found in 41 of 191 slides examined. *Pl. falciparum* was the infecting agent in 37, *Pl. vivax* in 2 and *Pl. malariæ* in 2. *Sp. Duttonni* was found in 3 cases. It is interesting that two of the patients were Europeans. The occurrence of this disease was remarked on last year, and in view of the difficulty that is frequently found in demonstrating the *spirochætes* in defined cases, it is probable that this disease is commoner than is assumed. All three cases undoubtedly contracted the disease in Matabeleland. Blood culture was positive in 8 instances out of a total of 54. The organisms isolated were *B. typhosus* in 3 cases, *B. paratyphosus A.* in 3 cases, *Alkaligenes fæcalis* in 1, and *Streptococcus viridans* in 1. The Grunbaum-Widal reaction was positive in 32 instances against members of the typhoid-paratyphoid group, while 58 tests were negative. Wassermann reactions were done on 735 specimens of blood and cerebro-spinal fluid. The number showing a positive reaction was 218, while 55 gave a partial or doubtful reaction, and 462 were negative. Examination of sputum for tubercle bacilli was positive in 13 instances out of a total of 112 examined. *B. diphtheriæ* was found in 17 of 116 swabs examined. During microscopical examination of urine, *S. hæmatobium* was found on 27 occasions, practically all the infections being in European juveniles. Biochemical examinations consisted of blood sugar 27, non-protein nitrogen 19, sugar tolerance tests 5, urea concentration tests 2, and test meals 4.

The Director of the Public Health Laboratory, Salisbury, last year drew attention to the high percentage of urinary infection in adult European females. His findings are true of the conditions here also, and there can be no doubt that urinary infection is responsible for much ill-defined illness. Attention has been given here to the identification of non-lactose fermenting coliform bacilli isolated from urinary infections, and it has been found that many distinct organisms, difficult to classify according to prevailing standards, may be responsible.

(3) Report of the Government Analyst, Salisbury.

Mr. A. W. Facer, F.I.C., Government Analyst, reports that 567 samples and exhibits were dealt with. They included 294 exhibits in connection with criminal investigation, 89 waters, 62 milks, 39 hop and kaffir beers, 20 disinfectants, etc.

Criminal Investigations comprised 171 exhibits in connection with 42 cases, in 24 of which analysis proved the administration of an identifiable poison, and in many of which it supplied important evidence in connection with establishing the identity of the guilty person. Arsenic was found in 9 cases, cyanide in 7, and strychnine in 1 case. "Native" poisons were found in 5 cases. The majority of the investigations were in connection with the native population, but Europeans were concerned in several. Eighty exhibits were examined for blood and other stains in connection with investigations concerning charges of murder, assault and rape, and the results frequently became cardinal evidence in capital and other serious charges. Other forensic work included analyses in connection with charges of arson and endeavours to establish clues in cases of murder, theft, etc., by comparisons of hairs, threads detached from clothes and examination of registered letters.

Waters.—The majority of these were in connection with the investigation and maintenance of the purity of public supplies under the control of the Government and of town and village councils. In most cases the results were satisfactory, though there were times when attention had to be drawn to suspicious features in some of the larger systems. In one case the continued sickness in a family was found to be due to spring water containing arsenic from subterranean sources.

Milks.—Analysis showed that 2 of the 62 samples were seriously below standard quality, and in both cases the vendors were prosecuted and convicted. The general quality was good, but occasional samples showed the necessity for regular control. *Customs Control* work prevents unfair competition from imported commodities by ensuring that they conform to defined quality standards, and in all doubtful cases produces the necessary figures for the correct assessment of the duty on alcoholic liquors, etc. One case occurred in which assessment based on analysis yielded greatly increased revenue. The necessity for the regular *control of beverages sold to natives* was shown in 12 out of 34 samples of hop beer being found to be intoxicating, some of them markedly so.

Drugs.—An investigation was performed to ensure that the supplies of ether and chloroform employed in Government institutions conformed to accepted standards of purity. Each consignment of "Government Quinine," as supplied under contract, was analysed and found to be entirely satisfactory.

Lectures.—With the co-operation of the Commissioner of Police, the Government Analyst continued to give lectures on the theory and practice of the scientific detection of crime to successive batches of police recruits and refresher groups. As the result of *original investigations* improved methods were evolved in connection with food analysis and the assessment of the strength of alcoholic fluids. The latter will enable Customs officials in distant ports to perform rapid checks on the *bona fides* of declarations.

Advisory Duties.—As the Government Institution dealing with the application of chemistry to matters not directly associated with mining and agriculture, the laboratory is freely consulted by Government Departments and the commercial, industrial and general public on matters of the most varied nature. The records again show that there is a steady increase in the demands made upon the branch in connection with State and public interests.

CHAPTER V.—ADMINISTRATIVE.

(1) Public Health Department.

(a) *Staff.*

1. Doctors (Permanent Establishment, 29; Aided, 6)	35
2. Dentists	2
3. Government Analyst	1
4. General Nurses	196
5. Mental Nurses	16
6. Other European Staff	62
7. Asiatic and Native Staff	320
	632

(b) *Expenditure and Revenue.*

Total Expenditure	£187,536
Total Revenue	34,530
Net Balance of Expenditure	£153,006

(c) *Southern Rhodesia Nursing Service.*

There are 196 nurses employed in Government Hospitals, of whom 100 are qualified and 96 student nurses. There were 228 applications for 36 vacancies for student nurses, i.e., 6 candidates for each vacancy. Appointments are made only from families who are living or have lived within the Colony. Amongst the qualified staff there were 115 applications for 21 vacancies. Ten of these appointments were given to nurses trained in the Government Service. There are not as yet sufficient of the latter to supply our needs. In addition to the above, there are 10 trained mental nurses and 6 untrained mental nurses at Ingutsheni Mental Hospital.

During the year one nurse obtained her Sister Tutor's Diploma at King's College, and was subsequently appointed a Sister Tutor in the Service. One nurse obtained her certificate of training at the Hospital for Tropical Diseases, London. One nurse was awarded a Beit training grant to study midwifery and mothercraft. Several nurses obtained midwifery diplomas in hospitals outside the Colony. The need for the new midwifery training school, which is contemplated in Bulawayo, becomes more urgent each year. The death of a valued member of the Service, Miss E. J. Robinson, is greatly regretted.

The following were the results of the examinations held by the Southern Rhodesia Medical Council in the nurses' training schools at Salisbury and Bulawayo Hospitals:—

	Number of candidates.	Number successful.	Number unsuccessful.
Preliminary Examination	28	24	4
Final Examination	11	11*	...

(*3 with honours)

Gold Medals presented by the British Medical Association of Southern Rhodesia were awarded to the best student at the final examinations held in April and October.

(2) Medical Council.

The numbers on the registers at the end of 1934 are given below. Not all of these are resident in Southern Rhodesia:—

	Additions 1934.	Total 31.12.34
Medical practitioners	11	144
Dental surgeons	2	40
Chemists and druggists	4	81
Trained nurses	32	154
Midwives	5	32
Mental nurses	...	4

(3) Habit Forming Drugs.

Import Certificates.—Fifty-nine permits were issued covering the importation of the following drugs during 1934, as compared with 82 in 1933. It should be pointed out that these figures represent permits asked for, and not amounts actually imported. The latter depends considerably upon stocks in hand at the end of the year:—

Drug.	1933 Ounces.	1934 Ounces.
Medicinal opium	16.0	32.0
Opium (in tinctures, extracts and other preparations)	426.0	369.8
Morphine alkaloid	31.8	15.6
Diacetyl morphine (heroin)	6.2	1.4
Ethyl morphine	2.0	0.45
Cocaine	25.0	24.3
Codeine phosphate	4.0	1.0
Extract cannab. indica	6.0	nil

Export Certificates.—Eighteen permits were issued, covering the export of the following drugs to Northern Rhodesia and the Union, as compared with 15 in 1933:—

Drug.	1933 Ounces.	1934 Ounces.
Medicinal opium	1.0	nil
Opium (in tinctures, extracts and other preparations)	3.2	20.8
Morphine alkaloid	2.0	0.4
Diacetyl morphine (heroin)	0.18	0.9
Cocaine	0.11	2.3

Eight permits were issued by the Veterinary Department in 1934 for the purchase of 78 ounces of tincture of opium, as against 10 in 1933 for 98 ounces.

Table I.

CLASSIFICATION OF DEATHS (EUROPEANS), 1934.

Deaths classified according to the International Classification of Causes of Sickness and Death.

I.—INFECTIOUS AND PARASITIC DISEASES.

Classification No.	Disease.	No. of Deaths.
1	Typhoid fever	10
9	Whooping cough	1
10	Diphtheria	5
11	Influenza	20
13	Dysentery	14
18	Cerebro-spinal fever	3
23	Tuberculosis of the respiratory system	10
24	Tuberculosis of the central nervous system	1
36	Purulent infection, septicæmia	3
38	Malaria	38
44 : 6	Blackwater fever	14
44	Other infectious diseases (Acrodynia)	1

II.—CANCER AND OTHER TUMOURS.

45	Cancer of the buccal cavity and pharynx	1
46	Cancer of the digestive organs and peritoneum	22
47	Cancer of the respiratory organs	3
48	Cancer of the uterus	3
49	Cancer of other female genital organs	1
50	Cancer of the breast	1
51	Cancer of the male genito-urinary organs	4
52	Cancer of the skin	2
52	Cancer of other or unspecified organs	4
54	Non-malignant tumours	1
55	Tumours of undetermined nature	2

III.—RHEUMATISM, DISEASES OF NUTRITION AND OF ENDOCRINE GLANDS, AND OTHER GENERAL DISEASES.

56	Rheumatic fever	1
57	Chronic rheumatism, Osteo-arthritis	2
59	Diabetes	14
66	Diseases of the thyroid and parathyroid glands	1
69	Other general diseases	2

IV.—DISEASES OF THE BLOOD AND BLOOD-FORMING ORGANS.

70	Hæmorrhagic conditions	1
71	Anæmia, Chlorosis	3
74	Other diseases of the blood and blood-forming organs	1

V.—CHRONIC POISONING.

75	Alcoholism (acute or chronic)	2

VI.—DISEASES OF THE NERVOUS SYSTEM AND SENSE ORGANS.

78	Encephalitis	1
79	Meningitis	1
81	Other diseases of the spinal cord	2
82	Cerebral hæmorrhage, apoplexy, etc.	17
85	Epilepsy	6
87	Other diseases of the nervous system	6

VII.—DISEASES OF THE CIRCULATORY SYSTEM.

91	Acute endocarditis	1
92	Chronic endocarditis, valvular disease	19
93	Diseases of the myocardium	30
94	Diseases of the coronary arteries, Angina pectoris	6
95	Other diseases of the heart	7
96	Aneurysm	1
97	Arterio-sclerosis	8
99	Other diseases of the arteries	3
102	Abnormalities of blood-pressure	4

VIII.—DISEASES OF THE RESPIRATORY SYSTEM.

106	Bronchitis	3
107	Broncho-pneumonia	10
108	Lobar pneumonia	15
109	Pneumonia (not otherwise defined)	8
110	Pleurisy	1
111	Congestion and hæmorrhagic infarct of lung, etc.	2
112	Asthma	1
114	Other diseases of the respiratory system	5

IX.—DISEASES OF THE DIGESTIVE SYSTEM.

115	Diseases of the buccal cavity, pharynx, etc.	2
117	Ulcer of the stomach or duodenum	3
118	Other diseases of the stomach	1
119 & 120	Diarrhœa and enteritis	9
121	Appendicitis	9
122	Hernia, intestinal obstruction	10
123	Other diseases of the intestines	2
124	Cirrhosis of the liver	3
125	Other diseases of the liver	1
126	Biliary calculi	2
127	Other diseases of the gall bladder and ducts	1

X.—NON-VENEREAL DISEASES OF THE GENITO-URINARY SYSTEM AND ANNEXA.

130	Acute nephritis	2
131	Chronic nephritis	7
132	Nephritis, not stated to be acute or chronic	6
133	Other diseases of the kidney and annexa	2
134	Calculi of the urinary passages	1
135	Diseases of the bladder	1
137	Diseases of the prostate	2
139	Diseases of the female genital organs	3

XI.—DISEASES OF PREGNANCY, CHILDBIRTH AND THE PUERPERAL STATE.

144	Puerperal hæmorrhage	2
145	Puerperal sepsis not returned as post-abortion	4
147	Other toxæmias of pregnancy	1
148	Puerperal phlegmasia alba dolens, embolism and sudden death	1
149	Other accidents of childbirth	1

XII.—DISEASES OF THE SKIN AND CELLULAR TISSUE.

153	Other diseases of the skin and its annexa	1

XIII.—DISEASES OF THE BONES AND ORGANS OF LOCOMOTION.

154	Acute infective osteomyelitis and periostitis	1

XIV.—CONGENITAL MALFORMATIONS.

157	Congenital malformations	5

XV.—DISEASES OF EARLY INFANCY.

158	Congenital debility	3
159	Premature birth	12
160	Injury at birth	1
161	Other diseases peculiar to early infancy	4

XVI.—OLD AGE.

162	Old age	4

XVII.—DEATHS FROM VIOLENCE.

162	Suicide by solid or liquid poisons and corrosive substances	3
165	Suicide by hanging or strangulation	2
167	Suicide by firearms	10
171	Suicide by other means	1
173	Homicide by firearms	1
174	Homicide by cutting or piercing instruments	1
175	Homicide by other means	1
179	Other acute accidental poisoning (not by gas)	4
181	Accidental burns (conflagration excepted)	1
183	Accidental drowning	2
184	Accidental injury by firearms	2
186	Accidental injury by fall, crushing, etc.	13
189	Hunger or thirst	1
194	Other and unstated forms of accidental violence	3
195	Violent deaths of unstated nature (i.e., accidental, suicidal, etc.)	1

XVIII.—ILL-DEFINED DISEASES.

200	Cause of death unstated or ill-defined	7
	Total	508

TABLE II.—Beds and Patients at Government General Hospitals, 1934.

Name of hospital.	No. of beds.		No. of inpatients treated.			Daily average of inpatients.			No. of units maintained.			Average No. of days each patient was in hospital.	
	European.	Coloured and native.	European.	Coloured and native.	Total.	European.	Coloured and native.	Total.	European.	Coloured and native.	Total.	European.	Coloured and native.
Salisbury ...	120	112	2,613	1,852	4,465	95.6	92.2	187.8	34,880	33,641	68,521	13.3	18.2
Bulawayo ...	123	151	1,898	2,631	4,529	95.8	142.8	238.6	34,984	52,122	87,106	18.4	19.8
Umtali ...	38	46	432	645	1,077	16.1	29.5	45.6	5,977	10,772	16,749	13.8	16.7
Gwelo ...	25	72	391	834	1,225	12.5	37.1	49.6	4,561	13,559	18,120	11.7	16.2
Gatooma ...	25	96	494	1,010	1,504	12.5	66.0	78.5	4,589	24,118	28,707	9.7	23.9
Fort Victoria	13	27	170	419	589	5.9	23.8	29.7	2,154	8,698	10,852	12.7	20.7
Gwanda ...	8	35	85	623	708	1.8	37.8	39.6	652	13,802	14,454	7.7	22.1
Enkeldoorn	16	13	173	638	811	3.7	22.2	25.9	1,354	8,104	9,458	7.9	12.7
Shamva ...	18	27	68	627	695	1.7	54.7	56.4	625	19,983	20,608	9.2	31 8
Sinoia ...	11	29	131	562	693	3.7	34.8	38.5	1,349	12,687	14,036	10 3	22.6
Ingutsheni	80	330	119	389	508	79.2	259.5	338.7	28,931	94,711	123,642	243.1 253	243.5
	477	938	6,574	10,230	16,804	328.5	800.4	1,128.9	120,056	292,197	412,253	357.8	448.2

TABLE III.—RETURN OF GOVERNMENT AND FREE PATIENTS IN GOVERNMENT GENERAL HOSPITALS DURING 1934.

Name of hospital.	Number of free patients.			Total No. of units treated.		
	European.	Coloured and native.	Total.	European.	Coloured and native.	Total.
Salisbury	643	1,175	1,818	11,870	23,961	35,831
Bulawayo	453	1,575	2,028	13,874	39,814	53,688
Umtali	103	541	644	1,961	9,640	11,601
Gwelo	106	554	660	1,584	10,234	11,818
Gatooma	55	324	379	669	12,595	*13,264
Fort Victoria	50	359	409	1,068	7,480	8 548
Gwanda	23	271	294	196	8,563	8,759
Enkeldoorn	87	599	686	702	7,691	8,393
Shamva	18	457	475	177	16,384	16,561
Sinoia	28	395	423	288	9,675	9,963
Ingutsheni	78	351	429	23,050	84,885	107,935

*Excluding V.D.

Table IV.—Statement of Expenditure and Revenue at Government General Hospitals for the Year 1934.

Name of hospital.	No. of patients treated	Votes 8 A & B.	Vote 8 C.	Gross expenditure.	Fees charged.	Revenue received.	Deficit revenue over expenditure	Revenue per cent. of gross expenditure.	Total amount outstanding.	
									End of 1933.	End of 1934.
		£	£	£	£	£	£		£	£
Salisbury	4,465	12,765	21,660	34,425	15,401	13,103	21,322	38.1	9,994	8,974
Bulawayo	4,529	10,439	19,833	30,272	12,575	8,883	21,389	29.3	7,972	9,547
Umtali	1,077	2,853	3,528	6,381	2,387	1,945	4,436	30.6	863	~~911~~ 971
Gwelo	1,225	3,022	3,859	6,881	1,784	1,358	5,523	19.7	741	944
Gatooma	1,504	2,102	4,165	6,267	2,808	2,155	4,112	34.4	1,132	1,195
Fort Victoria ...	589	1,231	1,428	2,659	613	354	2,305	13.3	625	783
Gwanda	708	720	1,105	1,825	492	288	1,537	15.8	318	385
Enkeldoorn	811	714	1,383	2,097	345	144	1,953	6.8	189	385
Shamva	695	748	1,192	1,940	442	223	1,717	11.5	455	557
Sinoia	693	892	2,008	2,900	695	336	2,564	11.6	2,073	2,424
Ingutsheni	508	5,772	6,204	11,976	2,766	2,371	9,605	19.8	1,522	1,795
Totals	16,109	41,258	66,365	107,623	40,288	31,160	76,463	—	25,884	27,900

APPENDIX.

By H. S. Leeson, F.R.E.S., A.R.San.I.
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INTRODUCTION.

This report is the result of an investigation inaugurated by the Government of Southern Rhodesia into the breeding habits of two species of Anopheline mosquitoes, namely, *Anopheles funestus*, Giles, and *Anopheles Gambiæ*, Giles. It is well known that these two species are important vectors of the malaria parasite in the tropical and sub-tropical portions of the continent of Africa. It has previously been shown that they are the only Anophelines to be found naturally infected with the parasite in Southern Rhodesia (Leeson, 1931). The object of the enquiry was to discover whether these species were definitely selective as to their choice of breeding places. If this was found to be so, then advantage could be taken of this specialisation to deal with these particular breeding places by anti-larval measures. Other waters not utilised by the carriers (but possibly preferred by other species of Anophelines) could safely be excluded from the control scheme.

This method of attempting to reduce the incidence of malaria by attacking the larvæ of the carriers and ignoring the other mosquitoes is known as " species sanitation."

I was seconded from the London School of Hygiene and Tropical Medicine for this work for a period of six months and commenced on the 2nd November, 1933. Observations have been made in Salisbury, Shamva, Bindura, Sinoia, Ndanga, Zaka, Umtali, Penhalonga, Old Umtali, Mtoko, Nyaderi and Mrewa areas. Positive and negative evidence was accumulated and found to be consistent at each place. It must be borne in mind, however, that in the circumstances, it was not possible to work simultaneously in all places. From a purely scientific point of view, the evidence is only applicable to the place and the time at which it was collected. Nevertheless, for general purposes, it may be fair to assume, in view of the consistency of the recorded findings, that these species of Anophelines have the same breeding habits throughout the Colony at whatever season they may be found.

WHERE ANOPHELINE LARVÆ WERE NEVER FOUND.

It may be advisable at the outset to indicate those collections of water where Anopheline larvæ were never found, both during the present enquiry and also during my previous visit to Southern Rhodesia in 1926-29. Such places include the following:—Baths, bins, bottles, buckets, bird baths, brick and cement channels (if clean and containing no vegetation), coco-pans, drums, fire buckets, tanks, tins, tubs, native vessels, roof gutterings, tree-holes, odds and ends of machinery, old motor tyres and waste water from baths and kitchens. All these have been examined many times, and although Culicine larvæ were invariably present, yet in no case was an Anopheline larva found. It is definite, therefore, that Anopheline mosquitoes in Southern Rhodesia do not utilise artificial water containers for breeding purposes. Anopheline larvæ have not been found in large bodies of deep water, such as reservoirs; they have not been found in those portions of rivers where the current is strong and fast. Mosquito larvæ breathe atmospheric air, therefore they are not to be found where the surface of the water is subject to great movement or agitation caused by strong currents or by wind and wave action.

CLASSIFICATION OF THE BREEDING PLACES OF ANOPHELINE MOSQUITOES.

The breeding places of Anopheline mosquitoes were found to be in water situated on the ground. If the water was in existence for a long enough period, then in such water at some time and in some part of it Anopheline larvæ were found.

For the purpose of this report, waters are divided into two main groups, running and standing. Natural running waters are, of course, rivers and streams; other running waters may be found in drains, furrows and irrigation channels. These latter are man-made and are often of a temporary nature, but because of the fact that when they are neglected and water runs in them long enough they come to resemble natural water courses, they will be grouped together with the streams under one head—*running water.* Standing water must be sub-divided into five groups, the first of which comprise *pools in stream-beds* or on banks, and in drains, furrows and irrigation channels. These are usually formed through the partial drying up of the water courses. The second group includes pools not in water courses but in depressions *on the veld.* The third group of pools is found in *borrow pits,* that is, excavations from which clay, sand or gravel has been taken for building or road-making purposes. The fourth group consists of small *puddles,* such as those in the hoof prints of cattle or in the ruts caused by the wheels of vehicles. The fifth kind of standing water is found in *swamps;* this type of breeding place is permanent and usually contains aquatic vegetation.

Where possible, the source of the water was also noted; that is, it may be rain water, river water or seepage. Other points observed were, whether the water was shaded or exposed, muddy or clear, and whether it contained vegetation or not.

Anopheline larvæ were sometimes found in unusual places which cannot be considered as breeding places. These may be therefore mentioned and dismissed:—(1) Cement reservoirs or sumps in neglected irrigation systems where the larvæ had obviously been washed in. *Anopheles funestus* var. *leesoni, A. longipalpis* and *A. rufipes.* (2) Corrugated iron tanks into which water was leaking from the surrounding ground, *A. rufipes.*

DISTRIBUTION OF ANOPHELES LARVÆ AMONG DIFFERENT TYPES OF BREEDING PLACES.

A. FUNESTUS.—The details of the breeding places of this species are collected together and given in Table 1, where it is plainly shown that *clear, shady streams containing vegetation* are the most prolific source of this species. The larvæ were found at the edges of the water, beneath overhanging grasses or weeds, where the current was slow and they were protected from the direct sunlight.

Neglected irrigation channels were also favoured by this species because they comply with the essential conditions regarding shade, etc. As regards the source of the water preferred by *A. funestus,* it must be stream water. Larvæ of this species were rarely found in seepage. *A. funestus* larvæ were never found in pools on the veld, borrow pits or in puddles.

A. GAMBIÆ.—Details of the breeding places of this species are given in Table 2. It will be noticed at once that they all consist of standing water and that vegetation is absent. The water is more often muddy than clear and almost always exposed to the sunshine. The most dangerous places are *borrow pits* in which water has been allowed to collect, *hoof prints of cattle* usually at the edges of broken down drainage ditches and at the margins of rivers, and very often *stagnant pools* in partially dried-up stream beds.

So long as these conditions prevail, the water may be either stream or rain water, but not seepage. Seepage water may be close at hand, but *A. gambiæ* larvæ will not be found in it, though other Anophelines may be present.

A. gambiæ larvæ have never been found in running water.

A most satisfactory piece of evidence of the distinction between the two types of breeding places was provided by my native collectors. On encountering any water they knew at once which species of *Anopheles* larvæ they would find. Further, they only had to be told at any time which species was required and, if it was anywhere in the district, they would bring in the larvæ of that species without fail.

Table 1.—Breeding places of *A. funestus* in S. Rhodesia, showing number of times larvæ of this species were collected:—

Breeding Place.	Times Collected.
1. Streams, running water—	
Stream water:—	
Shaded, clear, vegetation	24
Unshaded, clear, vegetation	1
Seepage water:—	
Shaded, clear, vegetation	2
2. Stream beds, standing pools—	
Rain water:—	
Shaded, clear, vegetation	1
Stream water:—	
Shaded, clear, vegetation	7
Unshaded, clear, vegetation	1
3. Swamps—	
Rain water:—	
Shaded, muddy, vegetation	1
Shaded, clear, vegetation	3
Stream water:—	
Shaded, clear, vegetation	1

Table 2.—Breeding places of *A. gambiæ* in S. Rhodesia, showing number of times larvæ of this species were collected:—

Breeding Place.	Times Collected.
1. Stream beds, standing pools—	
Rain water:—	
Unshaded, clear, no vegetation	1
Stream water:—	
Unshaded, muddy, no vegetation	19
2. On veld, standing pools—	
Rain water:—	
Shaded, muddy, no vegetation	1
Unshaded, muddy, no vegetation	1
3. Borrow pits, standing pools—	
Rain water:—	
Unshaded, muddy, no vegetation	22
4. Hoof prints, etc., standing puddles—	
Rain water:—	
Unshaded, muddy, no vegetation	17
Unshaded, clear, no vegetation	1
Stream water:—	
Unshaded, muddy, no vegetation	3

CONTROL.

A. Anti-Mosquito Measures:

Defence.—The house should be not less than half a mile to the windward of nearest stream on an open breezy site on the side of a hill or slope. All undergrowth must be cleared for two hundred yards around the house. This clearing can be extended in time. Some tall trees may be left, and ordinary gardening may be indulged in, but ferneries and climbing plants should be banished to beyond the two hundred yards limit. Native quarters should be fifty to a hundred yards away, either down wind or across wind, but certainly not up wind. If there are a large number of native employees, then they must live in a properly regulated compound at least half a mile away in any direction except to the windward. The area around native quarters must be cleared to a two hundred yards radius. Farm buildings should be as far away as is convenient, but not to windward, and the area around them cleared for two hundred yards.

The house should be screened. It is better to have a screened verandah all round the house than to have separate bits of screening on door and windows. One complete screen is much easier to maintain in good order.

Defects in small screens are more likely to be overlooked. Chimneys and ventilators must not be forgotten. The spaces between the corrugations of the iron roof over the top of the screen frame must be filled up. Doors must be on the windward side and fitted with springs and open outwards. They must not be held open with bricks or other weights, and certainly not between sunset and sunrise, as this is the time when *Anopheles* mosquitoes seek to enter. The screen frame should rest on a low wall; the bottoms of the doors should be of wood two feet high to protect the screening against accidental knocks and kicks.

The screening material may be either of iron wire (which is the cheapest and does not last so long), or of phosphor bronze, monel metal or stainless steel. These latter are more expensive but last many years and do not obstruct the light so much.

Occupants should use bed-nets between November and May if above 2,000 feet altitude. If below this level, it may be necessary to use bed-nets all year round. The net should have a band of stout calico one foot wide attached to the lower edge. The net should be placed in position before sundown and tucked under the mattress all round, not left hanging on the floor.

The interior of the dwelling should be as light as possible with no heavy dark hangings. Ceilings should be white.

Repellent.—Citronella oil smeared on the exposed parts of the body keeps off mosquitoes for a short time. Repellents may be used between sunset and bedtime. Wiping down the furniture with paraffin oil deters the adults from entering.

Attack.—Pyrethum-paraffin sprays may be used in the evenings to kill off any mosquitoes which may have gained entrance. Doors and windows must be closed before spraying, and for a quarter of an hour afterwards.

B. ANTI-LARVAL MEASURES :

Permanent anti-larval measures may be developed gradually and consist mainly of constructional work. *Roads* must be as straight as possible, properly cambered, drained and graded. Puddles must not be allowed to remain on roads or in drains. *Drains* should not discharge vaguely into the veld, but conducted either into permanent waterways or to a soakage area, artificial or natural. Obstructions must be removed from the drainage channels, as also must vegetation in the channels on the banks. At convenient places bridges should be placed for pedestrians, cattle and vehicles, so that the banks are not broken down.

Irrigation channels must be treated in the same way, properly graded, cleared of obstructions and clean-sided.

Large rivers are not so dangerous as small streams, unless there are backwaters which avoid the full force of the current.

Streams are a most difficult problem, and in many cases little can be done. If possible, the main channels should be kept clear and the formation of puddles and pools prevented. Canalization may be attempted. In any case there should be no vegetation between the stream and the house which would harbour the adults.

It is practically impossible to deal with *swamps* at the present time, although they may be drained, if not too large, by concentrating the water into a main canal. In some places the planting of trees has reduced the area somewhat, but it takes some years and constant attention by qualified forestry experts. A suitable species must be found and then planting is begun at the edges and the work gradually extends inwards year by year. At present it is advisable not to build near a swamp, or, if a house is already in existence in such a place, to use the defensive measures such as screening and sleeping under bed-nets. By the word "swamp" is meant a permanent collection of shallow standing water in which aquatic vegetation exists, not merely a *wet vlei*, which dries up periodically and contains only the ordinary veld vegetation. Wet vleis are much more easily drained.

Borrow pits which have been dug to obtain gravel, sand or clay should be either filled up at once or drained. If possible, they should be so dug that they do not hold water, particularly if they are within a mile of a house. In fact, all *puddles* and *pools* of water must be abolished, and the formation of new ones prevented. To this end *cattle* should not be allowed to graze within half a mile of any human habitation. The *hoof-prints* they make in soft mud, the damage they do to river banks and drainage channels, provide most dangerous breeding places for *A. gambiæ*. *Vegetable gardens* should also be beyond the half-mile limit.

Species Sanitation.—Works of a permanent or semi-permanent nature such as drainage, etc., require to be inspected at intervals in order that they may be maintained in working condition. In favour of these works it may be noted that although they may be expensive to install, yet their maintenance costs very little. On the other hand, temporary measures, oilings, etc., are cheaper, but they must be repeated every seven days, and the expense is a permanent regular charge, which in the long run would probably amount in the total to much more than the permanent works would have cost.

However, permanent anti-larval measures are not possible in most parts of the country, though municipalities, town management boards and others are advised to put these measures into operation as opportunity arises. In the meantime, species sanitation by means of larvicides is recommended.

Larvicidal measures are essentially of a temporary nature, and consequently must be repeated weekly. They may be adopted while the permanent measures are being developed, or in those cases where permanent measures are impossible.

Paris green dust consists of 1 part of Paris green (copper aceto-arsenite) mixed with 99 parts of road dust or other finely-powdered inert dust as a carrier. It is important that the mixture be perfectly dry and thoroughly mixed. Although the mixture is poisonous to *Anopheles* larvæ, it is quite harmless to fish, birds, domestic animals and man if swallowed in water. It is advisable that the Paris green itself be in charge of a responsible European.

Anopheles larvæ feed at the surface of the water at the edges, and the dust should be sprinkled through a calico bag by shaking it over the water. There are knapsack dusting appliances which may be used. Rain, wind and strong current destroy the effect of the poison and cause it to sink or be washed away. Dusting should not be done when rain threatens or a strong wind is blowing. Vegetation should be cut down before applying the dust, although a small amount of short vegetation is no disadvantage. The edges only of dams and streams need be dusted to kill larvæ of *A. funestus*, and 100 lbs. of the mixture will cover two miles four feet wide.

To kill *A. gambiæ* larvæ in pools the whole surface must be dusted, and 100 lbs. will suffice for an acre of water surface.

Paris green dust should be used rather than oil where the latter would damage the crops.

Oiling is best done by means of an oil-spray pump, but it may also be applied by scattering oil-soaked sawdust or by sinking a bag containing oil-soaked rags or sawdust weighted by a stone. The oil may also be applied by using a watering can with a fine rose. An oil mixture known as "Light Fuel Mixture," sold by the Shell Company, is satisfactory, but seven parts of waste motor oil mixed with one part of paraffin is also good.

The vegetation must be cut down to start with, and after that, the weekly oiling will keep it down. One gallon of mixture will cover 120 feet of water two feet wide. The choice between oil and Paris green must be made by the individual. Only two kinds of water need be treated, the edges of slowly moving streams and standing muddy pools and puddles. These are the chief breeding places of the malaria mosquitoes. Other waters, such as large rivers, wet vleis, wells, swamps and reservoirs are not so important. So far as the reduction of malaria is concerned, the water contained in artificial receptacles, such as tins, tyres, buckets and sagging roof gutters may be ignored altogether. With regard to small communities, villages and towns, this work might be organised by the local authority. The area to be treated might be divided into six portions and one district visited regularly on the same day of the week. Farmers, road gangs and other people living in isolated outside areas will have to attend to their own surroundings, though advice and information should always be available at the headquarters of the Public Health Service in Salisbury. The presence of *A. gambiæ* or *A. funestus* adults in a house should be taken as an indication of the existence of breeding waters close by, which have either been overlooked by the person responsible for the species control or that the work has not been carried out in an effective manner.

It is most important to realise that larvicides are only effective if applied regularly (weekly) and continuously throughout the wet season (November to May).

Suggestions and Recommendations.—In the course of time it may be possible to establish a Malaria Bureau or Research Station, which would be responsible for the anti-malaria propaganda and work throughout the territory. The duties of this body would be to establish one place as an example of perfect anti-malaria work from which they would not only gain experience as to methods and costs, but would give a stimulus to further efforts on the part of local authorities.

Such a body of workers would undertake identification of mosquitoes found in houses. They would give advice to management boards, miners, prospectors, farmers and school teachers; would publish pamphlets, address meetings, give demonstrations, and in many ways educate the population into a proper understanding of the seriousness of repeated or even only one attack of malaria. In the more populated areas the work of combating the malaria-carrying *Anophelines* might be apportioned to regional Malaria Committees which would not only carry out the anti-larval measures in their own districts, but might also conduct a systematic search of dwellings for adults. The catches would be of value in assessing the efficacy of the anti-larval work and enable a forecast to be made of the probable course of events during the ensuing month.

All this, of course, would take time to develop and for the necessary authority to be obtained. Perhaps the country is not yet ready for such an attack on the disease. In the meantime, therefore, it is recommended that a pamphlet be published immediately describing the life histories and breeding habits of *A. funestus* and *A. gambiæ*, and explaining the principles of species sanitation and the methods to be employed. Included in the pamphlet should also be information as to what materials to use, how to use them, the cost, where obtainable, where and at what intervals to oil or dust, and where it is not necessary to oil or dust. Propaganda is an important part of the campaign and at the outset most time should be given to this side of the work.